JDC 12611 REV. A PAGE 1 OF 2

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

INITIAL TDRR 25341 D.S. PGS 2

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-8-66	26929	1	1	WKM	ACM

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE (TURNON)

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.
2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.
3. From the coolant supply CALIBRATION CHART determine FLOW indicator readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.
4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.
5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)° F	33(±3) lbs/hr	ON
2. Not Used			OFF
3. PSA	60(±5)°F	120 (±10) lbs/hr	ON
4. CDU	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45° F. The Coldplates null at 72°F. If the Coldplates sensors are not connected the meter will indicate off scale on the low side and cannot be nulled.

6. Allow 15 minutes for initial Conditions

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

then readjust the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5° F to obtain temperatures specified in Table 1. Record the above temperature deviation.

7. Record the temperature deviation at the end of the 30 minute stabilization time.
8. Record Circuit No 1 flow.

PROCEDURE (TURNOFF)

1. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.
2. Set the MAIN POWER switch to OFF.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12611 REV. A INITIAL TDRR

JOB COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST

TITLE

SER. NO. DWG REV.

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F							
	PSA Coldplate Temperature Deviation	°F							
	CDU Coldplate Temperature Deviation	°F							
	LGC Coldplate Temperature Deviation	°F							
7	IMU Temperature Deviation	°F	-5				0		
	PSA Coldplate Temperature Deviation	°F	-5				0		
	CDU Coldplate Temperature Deviation	°F	-5				0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12611 REV. A

JOB COOLANT SUPPLY TURNON-TUNROFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
7 (cont)	LGC Coldplate Temperature Deviation	°F							
8	Circuit No. 1 Flow	cm	5.0				5.5		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-8-66	26929	1	1	WKA	ACM
B	5-25-66	29174	All	All	MMH	ACM

REFERENCES PS 6015000

IMPORTANT (See below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

A. INITIAL TURN ON (Coarse Adjustment)

B. OPERATING ADJUSTMENT

C. TURN OFF

D. TURN ON (General)

A. INITIAL TURNON (Coarse Adjustment)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.

3. From the coolant supply CALIBRATION CHART determine FLOW indicator

readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (In series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

6. Allow 15 minutes and then readjust the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±3°F of the null point for the IMU. Record the temperature deviations from the null of all components (including the LGC and PTA).

7. Record the temperature deviation at the end of the 30 minute stabilization time.

8. Record Circuit No. 1 flow.

B. OPERATING ADJUSTMENT

NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±3°F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

12. Set the MAIN POWER switch to ON.

13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

14. Wait 15 minutes and repeat step 9 as required.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12611 REV. B INITIAL TDRR

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F							
	PSA Coldplate Temperature Deviation	°F							
	CDU Coldplate Temperature Deviation	°F							
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F							
7	IMU Temperature Deviation	°F	-3				+3		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12611
REV. B

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
7 (cont)	PSA Coldplate Temperature Deviation	°F	-5				0		
	CDU Coldplate Temperature Deviation	°F	-8				0		
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F	-5				0		
8	Circuit No. 1 Flow	cm	5.0				5.5		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-8-66	26929	1	1	WKA	ACM
B	3-25-66	29174	All	All	MMD	ACM
C	6-28-66	29848	-	2	MMD	-

REFERENCES PS 6015000

IMPORTANT (See below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

A. INITIAL TURN ON (Coarse Adjustment)

B. OPERATING ADJUSTMENT

C. TURN OFF

D. TURN ON (General)

A. INITIAL TURNON (Coarse Adjustment)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.

3. From the coolant supply CALIBRATION CHART determine FLOW indicator

readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (In series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

6. Allow 15 minutes and then readjust the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±3°F of the null point for the IMU. Record the temperature deviations from the null of all components (including the LGC and PTA).

7. Record the temperature deviation at the end of the 30 minute stabilization time.

8. Record Circuit No. flow.

B. OPERATING ADJUSTMENT

NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±3°F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

12. Set the MAIN POWER switch to ON.

13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

14. Wait 15 minutes and repeat step 9 as required.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12611 REV. C INITIAL TDRR

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F							
	PSA Coldplate Temperature Deviation	°F							
	CDU Coldplate Temperature Deviation	°F							
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F							
7	IMU Temperature Deviation	°F	-3				+3		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
NO. 12611
REV C

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
7 (cont)	PSA Coldplate Temperature Deviation	°F	-5				0		
	CDU Coldplate Temperature Deviation	°F	-8				0		
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F							
8	Circuit No. 1 Flow	cm	5.0				5.5		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-8-66	26929	1	1	WKA	ACM
B	5-25-66	29174	All	All	MMT	ACM
C	6-28-66	29848	-	2	MMT	-
D	8-4-66	30520	2	-	EA	-

REFERENCES PS 6015000

IMPORTANT (See below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

A. INITIAL TURN ON (Coarse Adjustment)

B. OPERATING ADJUSTMENT

C. TURN OFF

D. TURN ON (General)

A. INITIAL TURNON (Coarse Adjustment)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.

3. From the coolant supply CALIBRATION CHART determine FLOW indicator

readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (In series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

NOTE: OIA power must be on to obtain correct indications in step 6.

6. Allow 15 minutes and then readjust the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±3°F of the null point for the IMU. Record the temperature deviations from the null of all components (including the LGC and PTA).

7. Record the temperature deviation at the end of the 30 minute stabilization time.

8. Record Circuit No. 1 flow.

B. OPERATING ADJUSTMENT

NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±3°F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

12. Set the MAIN POWER switch to ON.

13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

14. Wait 15 minutes and repeat step 9 as required.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12611 REV. D INITIAL TDRR

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F							
	PSA Coldplate Temperature Deviation	°F							
	CDU Coldplate Temperature Deviation	°F							
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F							
7	IMU Temperature Deviation	°F	-3				+3		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12611
REV. D

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
7 (cont)	PSA Coldplate Temperature Deviation	°F	-5				0		
	CDU Coldplate Temperature Deviation	°F	-8				0		
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F							
8	Circuit No. 1 Flow	cm	5.0				5.5		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT.	APPROVAL NASA
A	3-8-66	26929	1	1	WK	ACM
B	5-25-66	29174	All	All	MM	ACM
C	6-28-66	29848	-	2	MM	-
D	8-4-66	30520	2	-	EA	-
E	9-22-66	31254	2	All	EA	-

REFERENCES PS 6015000

IMPORTANT (See below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

A. INITIAL TURN ON (Coarse Adjustment)
B. OPERATING ADJUSTMENT
C. TURN OFF
D. TURN ON (General)

A. INITIAL TURNON (Coarse Adjustment)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.

3. From the coolant supply CALIBRATION CHART determine FLOW indicator

VERIFICATION WITH SIDL REQUIRED BEFORE USE

readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (In series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

NOTE: OIA power must be on to obtain correct indications in step 6.

6. Allow 15 minutes and then readjust the FLOW CONT and the TEMP CONT as necessary to obtain negative temperature indications on the null indicator of the GSE Distribution Box. Record the temperature deviations from the null of all components (including the LGC and PTA).

7. Deleted

8. Deleted

B. OPERATING ADJUSTMENT

NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5° F of the null point for the PSA and CDU and within ±3° F of the null point for the IMU. After temperature stabilization is obtained, record the temperature deviations from the null of all components (including the LGC and PTA). Record circuit No. 1 flow.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

12. Set the MAIN POWER switch to ON.

13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

14. Wait 15 minutes and repeat step 9 as required.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12611 JDC
REV. E
INITIAL TDRR

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F					0		
	PSA Coldplate Temperature Deviation	°F					0		
	CDU Coldplate Temperature Deviation	°F					0		
	CGC/LGC Coldplate Temperature Deviation	°F					0		
	PTA/PEA Coldplate Temperature Deviation	°F					0		
9	IMU Temperature Deviation	°F	-3				+3		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12611
REV. E

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
9 (cont)	PSA Coldplate Temperature Deviation	°F	-5				0		
	CDU Coldplate Temperature Deviation	°F	-8				0		
	CGC/LGC Coldplate Temperature Deviation	°F							
	PTA/PEA Coldplate Temperature Deviation	°F							
9	Circuit No. 1 Flow	cm	5.0				5.5		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 00150
Chg. 7-21-66

JOB G & N COOLANT SUPPLY TURNON-TURNOFF | JDC 12611 REV. F PAGE 1 OF 3 | INITIAL TDRR 25341 D.S. PGS 1

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-8-66	26929	1	1	WK	ACM
B	5-25-66	29174	All	All	MM	ACM
C	6-28-66	29848	-	2	MM	-
D	8-4-66	30520	2	-	EA	-
E	9-22-66	31254	2	All	EA	-
F	12-15-66	32341	2	All	EA	-

REFERENCES PS 6015000

IMPORTANT (See below)

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

A. INITIAL TURN ON (Coarse Adjustment)

B. OPERATING ADJUSTMENT

C. TURN OFF

D. TURN ON (General)

A. INITIAL TURNON (Coarse Adjustment)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.

3. From the coolant supply CALIBRATION CHART determine FLOW indicator

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readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (In series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

NOTE: OIA power must be on to obtain correct indications in step 6.

6. Allow 15 minutes and then readjust the FLOW CONT and the TEMP CONT as necessary to obtain negative temperature indications on the null indicator of the GSE Distribution Box. Record the temperature deviations from the null of all components (including the LGC and PTA). Record circuit no. 1 flow.

7. Deleted

8. Deleted

B. OPERATING ADJUSTMENT

NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5° F of the null point for the PSA and CDU and within ±3° F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

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D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

12. Set the MAIN POWER switch to ON.

13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

14. Wait 15 minutes and repeat step 9 as required.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

NO. 12611 JDC
REV. F
INITIAL TDRR

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F					0		
	PSA Coldplate Temperature Deviation	°F					0		
	CDU Coldplate Temperature Deviation	°F					0		
	CGC/LGC Coldplate Temperature Deviation	°F					0		
	PTA/PEA Coldplate Temperature Deviation	°F					0		
	Circuit No. 1 Flow	cm							

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 00149
Chg. 7-23-65

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC 12611 REV. - PAGE 1 OF 2
INITIAL TDRR 25341 D.S. PGS 1

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

PROCEDURE (TURNON)

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.
2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.
3. From the coolant supply CALIBRATION CHART determine FLOW indicator readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.
4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.
5. Adjust the Coolant Supply as indicated in Table 1.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU PTA	40(±3)° F	33(±3) lbs/hr	ON
2. Not Used			OFF
3. PSA	60(±5)°F	120 (±10) lbs/hr	ON
4. CDU	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45° F. The Coldplates null at 72°F. If the Coldplates sensors are not connected the meter will indicate off scale on the low side and cannot be nulled.

6. Allow 15 minutes for initial Conditions

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC 12611 REV - PAGE 2 OF 2

SUBSYSTEM LEM G & N SYSTEM

ASSY

then readjust the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5° F to obtain temperatures specified in Table 1. Record the above temperature deviation.

7. Record the temperature deviation at the end of the 30 minute stabilization time.
8. Record Circuit No 1 flow.

PROCEDURE (TURNOFF)

1. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.
2. Set the MAIN POWER switch to OFF.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12611
REV. _____
INITIAL TDRR 25341

JOB COOLANT SUPPLY TURNON-TURNOFF

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. _____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F							
	PSA Coldplate Temperature Deviation	°F							
	LGC and CDU Coldplate Temperature Deviation	°F							
7	IMU Temperature Deviation	°F	-5				0		
	PSA Coldplate Temperature Deviation	°F	-5				0		
	LGC and CDU Coldplate Temperature Deviation	°F	-5				0		
8	Circuit No. 1 Flow	cm	5.0				5.5		

* TO BE USED AS REQUIRED OR DESIRED

DATE _____

JOB GROUND SUPPORT EQUIPMENT TURNON | JDC 12612 REV. A PAGE 1 OF 3
INITIAL TDRR 27134 D.S. PGS 3

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	D.S.	APPROVAL MIT	NASA
A	4-14-66	28075	2	-	WK	ACM

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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JOB GROUND SUPPORT EQUIPMENT TURNON | JDC 12612 REV A PAGE 2 OF 3
SUBSYSTEM LEM G & N SYSTEM | ASSY

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

	Voltage	CROSSBAR CONTROL
a.	115V 60 cps GSE ϕA	279
b.	115V 60 cps GSE ϕB	180
c.	115V 60 cps GSE ϕC	280
d.	27VDC GSE Relay Power	179
e.	28VDC Var Buss Remote Sense	171
f.	+30VDC GSE Electronics	170
g.	-30VDC GSE Electronics	270
h.	115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel - All switches set to OFF and the RANGE SELECT to 1000V.

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A⟶B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL
INPUT VOLTS RMS to Any Position

i. Power Control panel -
VOLTAGE SELECT to AGC-OFF
RANGE SELECT to 1000V
AGC VOLTAGE switches to OFF
TEST SET to ON
STATION to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT⟶IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHAN V METERS to OFF
DE MARGINS to NORM
All others fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel - All switches to ON.

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

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JOB GROUND SUPPORT EQUIPMENT TURNON | JDC 12612 REV A PAGE 3 OF 3
SUBSYSTEM LEM G & N SYSTEM | ASSY

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90° and 0° respectively.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\,90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD}\,0^\circ - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 10612.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record $\epsilon_{TC}\,150^\circ$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150^\circ + \epsilon_{CZ}$$

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

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EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12612 JDC
REV. A
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	26		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12611
REV. A

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	ϵ_{TC} 150°	Deg.		° ' "			
24	θ	Deg.		° ' "			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. A

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD\ 90^\circ} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0^\circ} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150^\circ} + \epsilon_{CZ}$

DATE 15 MAR 66

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT.	APPROVAL NASA
A	4-14-66	28075	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

	Voltage	CROSSBAR CONTROL
a.	115V 60 cps GSE ϕA	279
b.	115V 60 cps GSE ϕB	180
c.	115V 60 cps GSE ϕC	280
d.	27VDC GSE Relay Power	179
e.	28VDC Var Bus Remote Sense	171
f.	+30VDC GSE Electronics	170
g.	-30VDC GSE Electronics	270
h.	115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. Power Control panel -
VOLTAGE SELECT to AGC-OFF
RANGE SELECT to 1000V
AGC VOLTAGE switches to OFF
STATION to ON
TEST SET to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT⟶IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHAN V METERS to OFF
DE MARGINS to NORM
All others fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90° and 0° respectively.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\,90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD}\,0^\circ - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 10612.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record $\epsilon_{TC}\,150^\circ$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150^\circ + \epsilon_{CZ}$$

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12612
REV. B
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612
REV. B

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	$\epsilon_{TC\ 150°}$	Deg.		° ' "			
24	θ	Deg.		° ' "			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. B

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

JOB GROUND SUPPORT EQUIPMENT TURNON

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4-14-66	28075	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM
C	6-16-66	29679	3	-	MM	

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

	Voltage	CROSSBAR CONTROL
a.	115V 60 cps GSE ØA	279
b.	115V 60 cps GSE ØB	180
c.	115V 60 cps GSE ØC	280
d.	27VDC GSE Relay Power	179
e.	28VDC Var Buss Remote Sense	171
f.	+30VDC GSE Electronics	170
g.	-30VDC GSE Electronics	270
h.	115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. Power Control panel -
VOLTAGE SELECT to AGC-OFF
RANGE SELECT to 1000V
AGC VOLTAGE switches to OFF
STATION to ON
TEST SET to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT⟶IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHAN V METERS to OFF
DE MARGINS to NORM
All others fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

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r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90° and 0° respectively.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\,90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD}\,0^\circ - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record $\epsilon_{TC}\,150^\circ$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150^\circ + \epsilon_{CZ}$$

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12612 JDC
REV. C
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ØA	VAC	105		125		
14.b	115V, 60 cps ØB	VAC	105		125		
14.c	115V, 60 cps ØC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612
REV. C

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	$\epsilon_{TC\ 150°}$	Deg.		° ' "			
24	θ	Deg.		° ' "			

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. C

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4-14-66	28075	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM
C	6-16-66	29679	3	-	MM	-
D	8-4-66	30516	3	-	EA	-

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE ØA	279
b. 115V 60 cps GSE ØB	180
c. 115V 60 cps GSE ØC	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Buss Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶ B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. Power Control panel -
VOLTAGE SELECT to AGC-OFF
RANGE SELECT to 1000V
AGC VOLTAGE switches to OFF
STATION to ON
TEST SET to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT ⟶ IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHAN V METERS to OFF
DE MARGINS to NORM
All others fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\,90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record $\epsilon_{TC}\,150^\circ$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150^\circ + \epsilon_{CZ}$$

NOTE: If calculated θ results in an angle approximately 330°, subtract 180° from the calculated value.

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12612
REV. D
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE ___ START ___ END ___ SITE / LOCATION
SER. NO. ___ DWG ___ REV. ___	TIME ___ START ___ END ___ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ___ SER. NO. ___ CAL DATE
NAME ___ SER. NO. ___ CAL DATE

CONDUCTED BY ___ NAME/AFFILIATION APPROVED BY ___ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ØA	VAC	105		125		
14.b	115V, 60 cps ØB	VAC	105		125		
14.c	115V, 60 cps ØC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612
REV. D

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	$\epsilon_{TC\ 150°}$	Deg.		° ' "			
24	θ	Deg.		° ' "			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. D

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

JOB GROUND SUPPORT EQUIPMENT TURNON

SUBSYSTEM LEM G & N SYSTEM ASSY.

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4-14-66	28075	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM
C	6-16-66	29679	3	-	MM	-
D	8-4-66	30516	3	-	EA	-
E	12-15-66	32342	2,3	-	EA	-

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE ϕA	279
b. 115V 60 cps GSE ϕB	180
c. 115V 60 cps GSE ϕC	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Buss Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position
Press ALARM RESET pushbutton to turn off alarms.

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶ B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. Power Control panel -
VOLTAGE SELECT to AGC-OFF
RANGE SELECT to 1000V
AGC VOLTAGE switches to OFF
STATION to ON
TEST SET to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT ⟶ IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHAN V METERS to OFF
DE MARGINS to NORM
All others fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

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r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\,90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record $\epsilon_{TC}\,150^\circ$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150^\circ + \epsilon_{CZ}$$

NOTE: If calculated θ results in an angle approximately 330°, subtract 180° from the calculated value.

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12612 JDC
REV. E
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START / END / SITE / LOCATION
SER. NO. / DWG / REV.	TIME START / END / TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4-14-66	28075	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM
C	6-16-66	29679	3	-	MM	-
D	8-4-66	30516	3	-	EA	-
E	12-15-66	32342	2,3	-	EA	-

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE ϕA	279
b. 115V 60 cps GSE ϕB	180
c. 115V 60 cps GSE ϕC	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Buss Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position
Press ALARM RESET pushbutton to turn off alarms.

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶ B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. Power Control panel -
VOLTAGE SELECT to AGC-OFF
RANGE SELECT to 1000V
AGC VOLTAGE switches to OFF
STATION to ON
TEST SET to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT ⟶ IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHAN V METERS to OFF
DE MARGINS to NORM
All others fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

DATE 15 MAR 66

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\ 90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record ϵ_{TC} 150° (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\ 150^\circ + \epsilon_{CZ}$$

NOTE: If calculated θ results in an angle approximately 330°, subtract 180° from the calculated value.

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12612
REV. E
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START / END / SITE / LOCATION
SER. NO. DWG REV.	TIME START / END / TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612
REV. E

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	$\epsilon_{TC\ 150°}$	Deg.		° ' "			
24	θ	Deg.		° ' "			

DATE 15 MAR 66

FORM 00147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. E

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

FORM 00148
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612
REV. E

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	$\epsilon_{TC\ 150°}$	Deg.		° ' "			
24	θ	Deg.		° ' "			

DATE 15 MAR 66

FORM 00147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. E

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

FORM 00148
Chg. 7-23-65

JOB GROUND SUPPORT EQUIPMENT TURNON

SUBSYSTEM LEM G & N SYSTEM ASSY.

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4-14-66	28975	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM
C	6-16-66	29679	3	-	MM	-
D	8-4-66	30516	3	-	EA	-
E	12-15-66	32342	2,3	-	EA	-
F	11-30-67	35186	2	-	EA	-

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE ϕA	279
b. 115V 60 cps GSE ϕB	180
c. 115V 60 cps GSE ϕC	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Buss Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position
Press ALARM RESET pushbutton to turn off alarms.

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶ B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. Power Control panel -
STATION to ON
TEST SET to ON
ACVM to ON

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT ⟶ IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHV METERS to OFF
DE MARGINS to NORM
All other switches fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

DATE 15 MAR 66

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD}\,90° - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record $\epsilon_{TC}\,150°$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150° + \epsilon_{CZ}$$

NOTE: If calculated θ results in an angle approximately 330°, subtract 180° from the calculated value.

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12612
REV. F
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612
REV. F

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	$\epsilon_{TC\ 150°}$	Deg.		° ' "			
24	θ	Deg.		° ' "			

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612
REV. F

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	4-14-66	28075	2	-	WK	ACM
B	5-25-66	29175	2,3	-	MM	ACM
C	6-16-66	29679	3	-	MM	-
D	8-4-66	30516	3	-	EA	-
E	12-15-66	32342	2,3	-	EA	-
F	11-30-67	35186	2	-	EA	-
G	3-22-68	35931	1,2	-	EA	-

REFERENCES PS 6015000

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.
2. Set the PTC POWER switch to OFF.
3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position.
2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines, and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors

are fully engaged, an audible click will be heard.

3. Check retention by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.
4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.)

CAUTION: Always use disengagement tool specified in following step. Manual disengagement may damage connector.

6. Insert the finger part of special tool FA 757702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.
4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.
5. Connect W120 connector P2 to "B" Harness connector 56J1.
6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.
7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.
8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.
9. Press the OIA ON pushbutton on the Test Control panel.
10. Set the POWER switch on the Digital Voltmeter panel to ON.
11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.
12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.
13. Allow 30 minutes warm up for the GSE.

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE ϕA	279
b. 115V 60 cps GSE ϕB	180
c. 115V 60 cps GSE ϕC	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Buss Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel -
All switches set to OFF
RANGE SELECT to 1000V
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -
REGISTER SELECT to OFF
TEST MODE to SYSTEM
MODE CONTROL to Any Position

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -
FUNCTION to TIME A ⟶B
FREQ-TIME to SEC
POWER to ON
GATE to AUTO
TRIGGER LEVEL to Any Position
INPUT VOLTS RMS to any position

i. AC Input panel (Back of Console)
STA POWER to ON
AUX OUTLETS to OFF

j. Oscilloscope panel
SCALE ILLUM - Any position but OFF

k. XY Interface panel
SCOPE to OFF
FREQ + PHASE to OFF
OUT⟶IN to OFF
Y MARGINS to NORM

l. RDC Interface panel -
CHV METERS to OFF
DE MARGINS to NORM
All other switches fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -
All switches to ON
INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. Power Control panel -
STATION to ON
TEST SET to ON
ACVM to ON

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.
17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.
18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.
19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\,90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 16012.
22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.
23. Obtain and record $\epsilon_{TC}\,150^\circ$ (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.
24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\,150^\circ + \epsilon_{CZ}$$

NOTE: If calculated θ results in an angle approximately 330°, subtract 180° from the calculated value.

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12612 REV. G INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		___° ___' ___"			
	ϕ_{22}	Deg.		___° ___' ___"			
17	ϵ_{cy}	Deg.		___° ___' ___"			
18	ϵ_{TD}	Deg.		___° ___' ___"			

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612 REV. G

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		___° ___' ___"			
20	ϕ_2	Deg.		___° ___' ___"			
21	θ_{31}	Deg.		___° ___' ___"			
	θ_{32}	Deg.		___° ___' ___"			
22	ϵ_{CZ}	Deg.		___° ___' ___"			
23	ϵ_{TC} 150°	Deg.		___° ___' ___"			
24	θ	Deg.		___° ___' ___"			

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12612 REV. G

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90° - \epsilon_{TD\ 90°} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0°} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150°} + \epsilon_{CZ}$

DATE 15 MAR 66

DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS 601500)

IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes

INTERVAL

TOOLS AND MATERIAL

PROCEDURE

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

	Voltage	CROSSBAR CONTROL
a.	115V 60 cps GSE ϕA	279
b.	115V 60 cps GSE ϕB	180
c.	115V 60 cps GSE ϕC	280
d.	27VDC GSE Relay Power	179
e.	28VDC Var Buss Remote Sense	171
f.	+30VDC GSE Electronics	170
g.	-30VDC GSE Electronics	270
h.	115V 400 cps	177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

a. Power Control panel - All switches set to OFF.

b. System Interface panel - All switches CCW or OFF (pushbutton lamps out) except AGC-XFORMER INPUT to NORMAL and DOWNLINK switch to D. L. 2 position, DOWNLINK ENABLE SW lighted.

d. Self Test panel - All switches CCW or OFF except EXECUTE to SINGLE and T67 TIMING to NORMAL.

d. Logic Drawer No. 1 - All switches CCW

e. Logic Drawer No. 2 - All switches CCW or (X) except TIMING INHIBIT to down position, COUNTER STOPS to OFF, and INHIBIT INTERRUPT to down position.

f. Programmer and Monitor panel - All switches CCW or OFF except TAPE to STEP, TEST MODE to SYSTEM.

g. STA POWER and AUX OUTLETS circuit breaker on lower rear of console to ON.

h. STATION POWER on Power Control panel ON. PWR FAILS lamp on CTS System Interface panel may light.

i. TEST SET on Power Control panel to ON.

ROTARY TABLE POSITIONING

16. Obtain and record ϕ_{21} and ϕ_{22} (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record ϵ_{cy} from the Mounting Fixture calibration decal.

18. Obtain and record ϵ_{TD} (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90° and 0° respectively.

19. Calculate the calibrated tilt axis Position 1 angle (ϕ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD}\, 90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle (ϕ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD}\, 0^\circ - \epsilon_{cy}$$

21. Obtain and record θ_{31} and θ_{32} (Rotary angle readout + indicator error) from JDC 10612.

DATE _____

22. Obtain and record ϵ_{CZ} from the Mounting Fixture calibration decal.

23. Obtain and record ϵ_{TC} 150° (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position θ.

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC}\, 150^\circ + \epsilon_{CZ}$$

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12612 REV. -

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
19	ϕ_1	Deg.		° ' "			
20	ϕ_2	Deg.		° ' "			
21	θ_{31}	Deg.		° ' "			
	θ_{32}	Deg.		° ' "			
22	ϵ_{CZ}	Deg.		° ' "			
23	ϵ_{TC} 150°	Deg.		° ' "			
24	θ	Deg.		° ' "			

DATE _____

TDRR 27134 MAR 15 1966

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12612 DC
REV. -
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps ϕA	VAC	105		125		
14.b	115V, 60 cps ϕB	VAC	105		125		
14.c	115V, 60 cps ϕC	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	ϕ_{21}	Deg.		° ' "			
	ϕ_{22}	Deg.		° ' "			
17	ϵ_{cy}	Deg.		° ' "			
18	ϵ_{TD}	Deg.		° ' "			

DATE _____

FORM 0011
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12612
REV. -

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD\ 90^\circ} - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD\ 0^\circ} - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC\ 150^\circ} + \epsilon_{CZ}$

DATE _____

FORM 0018
Chg. 7-23-65

JOB MASTER INITIALIZATION

JDC 12613 REV. A PAGE 1 OF 2
INITIAL TDRR 27134 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM

REFERENCES
PS-6015000

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.

9. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. Observe that each lamp listed lights.

10. Set the CROSSBAR CONTROL to 173.

11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

13. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	Press RSET		
c.	VERB 41	NOUN 20	ENTR
d.	Observe VERB 21	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 22	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 23	NOUN 22	Flashing
i.	+00000		ENTR
j.	Observe VERB 41	NOUN 20	Displayed

DATE 15 MAR 66

JOB MASTER INITIALIZATION

INITIAL TDRR 27134 D.S. PGS. 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM
B	7-6-66	30043	2	-	MM	-

REFERENCES PS-6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.

9. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. At each position press the TEST START pushbutton. Observe that each lamp listed lights.

10. Set the CROSSBAR CONTROL to 173.

11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

13. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	Press RSET		
c.	VERB 41	NOUN 20	ENTR
d.	Observe VERB 21	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 22	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 23	NOUN 22	Flashing
i.	+00000		ENTR
j.	Observe VERB 41	NOUN 20	Displayed

DATE 15 MAR 66

JDC 12613 REV. C PAGE 1 OF 2

JOB MASTER INITIALIZATION

INITIAL TDRR 27134 D.S. PGS. 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM
B	7-6-66	30043	2	-	MM	-
C	8-4-66	30521	2	-	EA	-

REFERENCES

PS-6015000

IMPORTANT

See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON

400 CPS POWER ON

ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.

9. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. At each position press the TEST START pushbutton. Observe that each lamp listed lights.

10. Set the CROSSBAR CONTROL to 173.

11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

13. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	Press RSET		
c.	VERB 41	NOUN 20	ENTR
d.	Observe VERB 21	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 22	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 23	NOUN 22	Flashing
i.	+00000		ENTR
j.	Observe VERB 41	NOUN 22	Displayed

DATE 15 MAR 66

JOB MASTER INITIALIZATION

JDC 12613 REV. D PAGE 1 OF 2
INITIAL TDRR 27134 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM
B	7-6-66	30043	2	-	MM	-
C	8-4-66	30521	2	-	EA	-
D	12-28-66	32470	2	-	EA	-

REFERENCES
PS-6015000

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.

9. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. At each position press the TEST START pushbutton. Observe that each lamp listed lights.

10. Set the CROSSBAR CONTROL to 173.

11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

13. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	Press RSET		
c.	VERB 40	NOUN 20	ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe VERB 23	NOUN 22	Flashing
j.	+00000		ENTR
k.	Observe VERB 41	NOUN 22	Displayed

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:

a.	VERB 57	ENTR
b.	00015	ENTR

DATE 15 MAR 66

JOB MASTER INITIALIZATION

JDC 12613 REV. E PAGE 1 OF 2

INITIAL TDRR 27134 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM
B	7-6-66	30043	2	-	MM	-
C	8-4-66	30521	2	-	EA	-
D	12-28-66	32470	2	-	EA	-
E	1-26-67	32800	All	-	EA	-

REFERENCES: PS-6015000

IMPORTANT: See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.
2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON

400 CPS POWER ON

ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

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5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Set the CROSSBAR CONTROL to 173.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

10. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

11. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	Press RSET		
c.	VERB 40	NOUN 20	ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe VERB 23	NOUN 22	Flashing
j.	+00000		ENTR
k.	Observe VERB 41	NOUN 22	Displayed

12. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

13. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	00015		ENTR
c.	VERB 21	NOUN 01	ENTR
d.	00370		ENTR
e.	16002		ENTR

DATE 15 MAR 66

JOB MASTER INITIALIZATION

JDC 12613 REV. F PAGE 1 OF 2

INITIAL TDRR 27134 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM
B	7-6-66	30043	2	-	MM	-
C	8-4-66	30521	2	-	EA	-
D	12-28-66	32470	2	-	EA	-
E	1-26-67	32800	All	-	EA	-
F	9-1-67	34503	2	-	EA	-

REFERENCES PS-6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.
2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON

400 CPS POWER ON

ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

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Chg. 7-23-65

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Set the CROSSBAR CONTROL to 173.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

10. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

11. Perform the following DSKY operations:

a.	VERB 36		ENTR
b.	Press RSET		
c.	VERB 40	NOUN 20	ENTR
d.	VERB 41	NOUN 20	ENTR
e.	Observe VERB 21	NOUN 22	Flashing
f.	+00000		ENTR
g.	Observe VERB 22	NOUN 22	Flashing
h.	+00000		ENTR
i.	Observe VERB 23	NOUN 22	Flashing
j.	+00000		ENTR
k.	Observe VERB 41	NOUN 22	Displayed

12. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

13. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	00015		ENTR
c.	VERB 21	NOUN 01	ENTR
d.	00370		ENTR
e.	16002		ENTR

14. Perform the following DSKY operations:

a.	VERB 25	NOUN 01	ENTR
b.	03770		ENTR
c.	10067		ENTR
d.	04317		ENTR
e.	01770		ENTR

15. Perform the following DSKY operations:

a.	VERB 25	NOUN 26	ENTR
b.	01000		ENTR
c.	01770		ENTR
d.	00007		ENTR
e.	VERB 30		ENTR

DATE 15 MAR 66

JOB MASTER INITIALIZATION

JDC 12613 REV. G PAGE 1 OF 2
INITIAL TDRR 27134 D.S. PG'S 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29384	All	-	MM	ACM
B	7-6-66	30043	2	-	MM	-
C	8-4-66	30521	2	-	EA	-
D	~~12-28-66~~	32470	2	-	EA	-
E	1-26-67	32800	All	-	EA	-
F	9-1-67	34503	2	-	EA	-
G	8-5-68	36627	2	-	EA	-

REFERENCES: PS-6015000

IMPORTANT: See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.
2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

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5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Set the CROSSBAR CONTROL to 173.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

10. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.

11. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET
c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 41 NOUN 20 ENTR
e. Observe VERB 21 NOUN 22 Flashing
f. +00000 ENTR
g. Observe VERB 22 NOUN 22 Flashing
h. +00000 ENTR
i. Observe VERB 23 NOUN 22 Flashing
j. +00000 ENTR
k. Observe VERB 41 NOUN 22 Displayed

12. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

13. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR

14. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 03770 ENTR
c. 10067 ENTR
d. 04317 ENTR
e. 01770 ENTR

15. Perform the following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 01000 ENTR
c. 01770 ENTR
d. 00007 ENTR
e. VERB 30 ENTR
f. Observe: COMP ACTY lamp is lighted.

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JOB MASTER INITIALIZATION

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INITIAL TDRR 27134 D.S. PGS 0

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	6-7-66	29384	All	-	MM	ACM	PS-6015000
B	7-6-66	30043	2	-	MM	-	
C	8-4-66	30521	2	-	EA	-	IMPORTANT
D	12-28-66	32470	2	-	EA	-	See below
E	1-26-67	32800	All	-	EA	-	
F	9-1-67	34503	2	-	EA	-	INTERVAL
G	8-5-68	36627	2	-	EA	-	
H	9-20-68	36843	2	-	EA	-	TOOLS AND MATERIAL

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.
2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the step or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:

CGC/LGC POWER ON
400 CPS POWER ON
ISS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.

8. Set the CROSSBAR CONTROL to 173.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

10. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.

11. Perform the following DSKY operations:

a. VERB 36 ENTR
b. Press RSET
c. VERB 40 NOUN 20 ENTR
Wait 5 seconds
d. VERB 36 ENTR
e. VERB 41 NOUN 20 ENTR
f. Observe VERB 21 NOUN 22 Flashing
g. +00000 ENTR
h. Observe VERB 22 NOUN 22 Flashing
i. +00000 ENTR
j. Observe VERB 23 NOUN 22 Flashing
k. +00000 ENTR
l. Observe VERB 41 NOUN 22 Displayed

12. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

13. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR

14. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 03770 ENTR
c. 10067 ENTR
d. 04317 ENTR
e. 01770 ENTR

15. Perform the following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 01000 ENTR
c. 01770 ENTR
d. 00007 ENTR
e. VERB 30 ENTR
f. Observe: COMP ACTY lamp is lighted.

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JOB MASTER INITIALIZATION

JDC 12613 REV. - PAGE 1 OF 2

INITIAL TDRR _____ D.S. PGS 0

TDRR 27134 MAR 15 1966

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS-6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.
2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.
3. Monitor the Test Control panel to insure the following indicators are lighted:
   OIA PILOT POWER
   OIA DUCOSYN POWER ON
4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.
5. Insure that the OIA ON pushbutton on the Test Control panel is lighted.

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6. Insure that the following items of test equipment are turned on:
   Digital Recorder
   Dual Beam Oscilloscope
   Monitor Oscilloscopes
   Signal Generator
   Digital Voltmeter
   Counter
   Phase Angle Voltmeter
   Oscillograph
   Remote Counter Indicator
7. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.
8. Monitor the Test Control panel to determine that the following pushbuttons and indicators are lighted:
   ISS POWER DIABLED
   PROCEED
9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than ±2.5 vdc.
10. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than ±2.5 vdc.
11. Press the ALARM TEST pushbutton on the Test Selector Panel. The ALARM TEST pushbutton shall light.
12. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. Observe that each lamp listed lights.
13. Set the CROSSBAR CONTROL to 171.
14. Adjust the G&N POWER ADJUST control on the Test Control until the DVM indicates 28.0 (±0.25) vdc.

DATE _____

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Perform the following DSKY operations:

a. VERB 36	ENTR
b. RESET	PRESS
c. VERB 57	ENTR
d. 00015	ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ ISS POWER DISABLED pushbutton.

4. Press the CGC/ LGC POWER ON and the

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400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

5. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

6. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

7. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

8. Set the Rotary Table Tilt axis to approximately 0.00 degrees.

9. Set the Rotary Table Rotary axis to approximately 330.00 degrees.

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DESCRIPTION: Since the G & N check has been completed and various parts of the G & N system have been replaced, the G & N system will have to be turned on and off many times. This procedure will be utilized as appropriate.

Rev Ltr	Date	TOAR No.	PAGES REVISED DOC	DS	APPROVAL NT	NASA
A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REFERENCES: PS-60 [illegible]

IMPORTANT: Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the GSA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/LGC POWER OFF and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER OFF, 400 CPS POWER ON and the PROCEED portion of the PROCEED/INS STANDBY pushbuttons light, press the PROCEED/INS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Perform the following DSKY operations:

a. VERB 36	ENTR
b. RESET	PRESS
c. VERB 37	ENTR
d. 00015	ENTR

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N system has been in the power off state for less than 5 minutes with the gimbals in the parked position (0 roll and outer gimbal at 0°) and Middle gimbal at 180°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N system has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N system has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/INS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates [illegible] vdc, TM will proceed to step 7.

7. Press the PROCEED/INS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ±0.25 vdc.

B. GENERAL G & N SYSTEM - GSA DOWN MODING FROM INS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. -00000		ENTR

2. Press the PROCEED/INS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the INS STANDBY portion shall light.

NOTE: If a lower mode than INS Standby is desired, proceed.

3. Press the GSA OK/INS POWER DISABLED pushbutton.

4. Press the CGC/LGC POWER OFF and the

400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than GSA ON is desired, proceed.

5. Press the POWER OFF pushbutton on the Test Control panel of the GSA or on the Emergency Shut Down panel of the Coolant Console. The GSA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

6. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

7. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2, 3	1	EA	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Perform the following DSKY operations:

a. VERB 36	ENTR
b. RESET	PRESS
c. VERB 57	ENTR
d. 00015	ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617), the PIPA Scale Factor Tests (JDC 12624), or the PIPA Misalignment Tests (JDC 12625) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

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Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

12. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ ISS POWER DISABLED pushbutton.

4. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

5. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

6. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

7. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12614
REV. C
INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START / END / SITE / LOCATION
SER. NO. DWG REV.	TIME START / END / TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication =	a
	Time of day =	b
12	Row 1 indication =	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = _____ hours	d
	Time to overflow = 23.3 - line d = _____ hours	e
	Time of overflow = line b + line e = _____	

DATE _____

FORM 00146
Chg. 7-23-65

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2,3	1	EA	-
D	12-28-66	32478	All	All	JP	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Perform the following DSKY operations:

a. VERB 36	ENTR
b. RESET	PRESS
c. VERB 57	ENTR
d. 00015	ENTR

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NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

7. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

8. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617), the PIPA Scale Factor Tests (JDC 12624), or the PIPA Misalignment Tests (JDC 12625) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

11. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

DATE 15 MAR 66

Record the indication of Row 1 and the time of day.

12. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

13. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

14. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

4. Perform the following DSKY operations:

VERB 60	ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12614 REV. D INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
11	Row 1 indication =	a
	Time of day =	b
13	Row 1 indication =	c
14	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = _____ hours	d
	Time to overflow = 23.3 - line d = _____ hours	e
	Time of overflow = line b + line e = _____	

DATE _____

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2,3	1	EA	-
D	12-28-66	32478	All	All	JP	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Perform the following DSKY operations:

a. VERB 36	ENTR
b. RESET	PRESS
c. VERB 57	ENTR
d. 00015	ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM | ASSY

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

7. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

8. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617), the PIPA Scale Factor Tests (JDC 12624), or the PIPA Misalignment Tests (JDC 12625) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

11. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM | ASSY

Record the indication of Row 1 and the time of day.

12. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

13. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

14. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

4. Perform the following DSKY operations:

VERB 60	ENTR

Press and hold the STBY pushbutton until the STBY indicator lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC NO. 12614 REV. D INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START / END / SITE / LOCATION
SER. NO. DWG REV.	TIME START / END / TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
11	Row 1 indication =	a
	Time of day =	b
13	Row 1 indication =	c
14	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = _____ hours	d
	Time to overflow = 23.3 - line d = _____ hours	e
	Time of overflow = line b + line e = _____	

DATE _____

FORM 00146
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2, 3	1	EA	-
D	12-28-66	32478	All	All	JP	-
E	4-20-67	33652	All	All	EA	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

3. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

4. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

5. Perform the following DSKY operations:

a. VERB 36 ENTR
b. RESET PRESS
c. VERB 57 ENTR
d. 00015 ENTR

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 135°F, allow 30 minutes to elapse before proceeding.

d. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

14. Perform JDC 12613 to establish a Master Initialization condition.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe VERB 23 NOUN 22 Flashing
g. +09000 ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

4. Perform the following DSKY operations:

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12614
REV. E
INITIAL TDRR 27114

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = _ _ _ _ _	a
	Time of day = _____ hours _____ minutes	b
12	Row 1 indication = _ _ _ _ _ .	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = _____ hours _____ minutes	f
	Time of overflow = line b + line f = _____ hours _____ minutes	g

DATE 15 MAR 66

FORM 00146
Chg. 7-23-65

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2, 3	1	EA	-
D	12-28-66	32478	All	All	JP	-
E	4-20-67	33652	All	All	EA	-
F	9-21-67	34647	4	-	EA	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

3. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

4. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

5. Perform the following DSKY operations:

a. VERB 36 ENTR
b. RESET PRESS
c. VERB 57 ENTR
d. 00015 ENTR

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 135°F, allow 30 minutes to elapse before proceeding.

d. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR
00003 ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR
01300 ENTR
Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

14. Perform JDC 12613 to establish a Master Initialization condition.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +09000 ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

3A. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR
d. Observe all status lamps are off.

4. Perform the following DSKY operations:

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12614
REV. F
INITIAL TDRR 27134

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = __ __ __ __ __	a
	Time of day = _____ hours _____ minutes	b
12	Row 1 indication = __ __ __ __ __ .	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = _____ hours _____ minutes	f
	Time of overflow = line b + line f = _____ hours _____ minutes	g

DATE 15 MAR 66

FORM 0146
C.g. 7-1 3-65

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2, 3	1	EA	-
D	12-28-66	32478	All	All	JP	-
E	4-20-67	33652	All	All	EA	-
F	9-21-67	34647	4	-	EA	-
G	3-28-68	35981	1, 2, 4	-	EA	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

2. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

3. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the PRO (or STBY) pushbutton until the lamp goes out.

4. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

5. Perform the following DSKY operations:

a. VERB 36	ENTR
b. RESET	PRESS
c. VERB 57	ENTR
d. 00015	ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

NOTE: Standby Requirements. Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 135°F, allow 30 minutes to elapse before proceeding.

d. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 12 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignmem Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

12. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

14. Perform JDC 12613 to establish a Master Initialization condition.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

3A. Perform following DSKY operations:

a. VERB 57		ENTR
b. Observe		
VERB 21	NOUN 01	Flashing
c. 00015		ENTR

d. Observe all status lamps are off.

4. Perform the following DSKY operations:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

Press and hold the PRO (or STBY) pushbutton until the STBY condition lamp lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12614
REV. G
INITIAL TDRR 27131

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
10	Row 1 indication = __ __ __ __ __	a
	Time of day = _____ hours _____ minutes	b
12	Row 1 indication = __ __ __ __ __ .	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = _____ hours _____ minutes	f
	Time of overflow = line b + line f = _____ hours _____ minutes	g

DATE 15 MAR 66

FORM 0146
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2, 3	1	EA	-
D	1-28-66	32478	All	All	JP	-
E	4-20-67	33652	All	All	EA	-
F	9-21-67	34647	4	-	EA	-
G	3-28-68	35981	1, 2, 4	-	EA	-
H	4-9-68	36047	1, 4	All	EA	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. TEMP alarm lamp on DSKY may light. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.

4. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

5. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 01362 ENTR
d. 00000 ENTR ENTR
e. Observe:
VERB 21 NOUN 01 Flashing
f. 01365 ENTR
g. 00000 ENTR
h. NOUN 15 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

SUBSYSTEM LEM G & N SYSTEM | ASSY

i. Observe:
VERB 21 NOUN 15 Flashing
j. 00000 ENTR ENTR
k. Observe:
VERB 21 NOUN 15 Flashing
l. 00000 ENTR ENTR
m. Observe:
VERB 21 NOUN 15 Flashing
n. 00000 ENTR
o. VERB 21 NOUN 27 ENTR
p. Observe:
VERB 21 NOUN 27 Flashing
q. 00010 ENTR

Allow test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "None" on data sheet.

NOTE: Standby Requirements. Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 135°F, allow 30 minutes to elapse before proceeding.

d. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

SUBSYSTEM LEM G & N SYSTEM | ASSY

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:
VERB 01 NOUN 10 ENTR
00003 ENTR
Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:
VERB 21 NOUN 01 ENTR
01300 ENTR
Row 1 indication from step 10 ENTR

12. Perform the following DSKY operations:
VERB 06 NOUN 02 ENTR
01300 ENTR
Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

14. Perform JDC 12613 to establish a Master Initialization condition.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing

SUBSYSTEM LEM G & N SYSTEM | ASSY

e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +09000 ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

3A. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe
VERB 21 NOUN 01 Flashing
c. 00015 ENTR
d. Observe all status lamps are off. TEMP alarm lamp on DSKY may light.

4. Perform the following DSKY operations:
VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR
Press and hold the PRO (or STBY) pushbutton until the STBY condition lamp lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12614
REV. H
INITIAL TDRR 27134

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ___	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
5	Self test failures _____	
10	Row 1 indication = _ _ _ _ _ _	a
	Time of day = _____ hours _____ minutes	b
12	Row 1 indication = _ _ _ _ _ _ .	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = _____ hours _____ minutes	f
	Time of overflow = line b + line f = _____ hours _____ minutes	g

DATE 15 MAR 66

FORM 00146
Chg. 7-23-65

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29176	All	-	MM	ACM
B	7-5-66	30044	3	-	MM	ACM
C	10-20-66	31616	2, 3	1	EA	-
D	12-28-66	32478	All	All	JP	-
E	4-20-67	33652	All	All	EA	-
F	9-21-67	34647	4	-	EA	-
G	3-28-68	35981	1, 2, 4	-	EA	-
H	4-9-68	36047	1, 4	All	EA	-
J	8-5-68	36628	1, 4	-	EA	-

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The LGC WARNING lamp on the Monitor panel may remain on for approximately 10 seconds following application of +28 VDC LGC operate power. TEMP alarm lamp on DSKY may light. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.

4. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

5. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. Observe:		
VERB 21	NOUN 01	Flashing
c. 01362		ENTR
d. 00000		ENTR ENTR
e. Observe:		
VERB 21	NOUN 01	Flashing
f. 01365		ENTR
g. 00000		ENTR
h. NOUN 15		ENTR

i. Observe:		
VERB 21	NOUN 15	Flashing
j. 00000		ENTR ENTR
k. Observe:		
VERB 21	NOUN 15	Flashing
l. 00000		ENTR ENTR
m. Observe:		
VERB 21	NOUN 15	Flashing
n. 00000		ENTR
o. VERB 21	NOUN 27	ENTR
p. Observe:		
VERB 21	NOUN 27	Flashing
q. 00010		ENTR

Allow test to run for 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "None" on data sheet.

NOTE: Standby Requirements. Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 135°F, allow 30 minutes to elapse before proceeding.

d. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
01300		ENTR
Row 1 indication from step 10		ENTR

12. Perform the following DSKY operations:

VERB 06	NOUN 02	ENTR
01300		ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

14. Perform JDC 12613 to establish a Master Initialization condition.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing

e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

3A. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00034		ENTR
c. 00000		ENTR
d. Observe:		
GIMBAL LOCK lamp is off		
e. VERB 21	NOUN 01	ENTR
f. 00322		ENTR
g. 40000		ENTR
h. Observe:		
NO ATT lamp is off.		

4. Perform the following DSKY operations:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

Press and hold the PRO (or STBY) pushbutton until the STBY condition lamp lights.

5. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

6. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

7. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

8. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 1

JDC
NO. 12614
REV. J
INITIAL TDRR 2714

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS	
5	Self test failures _____	
10	Row 1 indication = _ _ _ _ _	a
	Time of day = _____ hours _____ minutes	b
12	Row 1 indication = _ _ _ _ _ .	c
13	Hours in high order scaler = $\frac{\text{line c}}{3600}$ X 5.12 = ___ . ___ hours	d
	Time to overflow = 23.3 - line d = ___ . ___ hours	e
	Line e converted to hours and minutes = _____ hours _____ minutes	f
	Time of overflow = line b + line f = _____ hours _____ minutes	g

DATE 15 MAR 66

FORM 00146
Chg. 7-23-65

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS-6015000

IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.

INTERVAL

TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Press the OIA ON/ISS POWER DISABLED and the G/N POWER A BUS pushbuttons on the Test Control panel.

3. Establish a Master Initialization Condition.

4. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

5. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

6. Perform the following DSKY operations:

a. VERB 36		ENTR
b. RESET		PRESS
c. VERB 57		ENTR
d. 00015		ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

NOTE: If this procedure is being performed after an abnormal shutdown which resulted in the system being shut off for more than 15 minutes, a two hour waiting period for PIPA suspension stabilization is required before proceeding.

7. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 8.

8. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +09000		ENTR

2. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

3. Press the OIA ON/ISS POWER DISABLED pushbutton.

4. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

5. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 7.

6. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

DATE _____

7. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

8. Set the Rotary Table Tilt axis to approximately 0.00 degrees.

9. Set the Rotary Table Rotary axis to approximately 330.00 degrees.

DATE _____

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

7. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

8. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

9. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

10. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.

LOW BUS TEMPERATURE CONTROL

11. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG temperature deviation voltage indicated on the DVM.

12. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA temperature deviation voltage indicated on the DVM.

13. After one hour, set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG temperature deviation voltage indicated on the DVM.

14. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA temperature deviation voltage indicated on the DVM.

15. Calculate the difference between the IRIG and PIPA temperatures measured in steps 13 and 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.

INPUT VOLTS RMS switch to 6

SLOPE switch to +

GATE switch to OPEN

TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console.

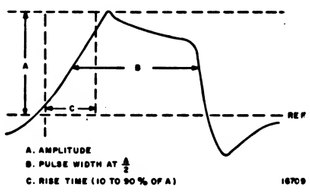
26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

27. Disconnect cable W259 (2014470-011) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.

28. Connect a jumper from the remaining CLOCK connector on the Interface Signals patchboard to either 1 MEG input channel of the Oscilloscope on the CTS.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

36. Perform the following DSKY operations:

a. RESET	Press
b. VERB 36	ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 27	ENTR
d. 77767		ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12615
REV. A
INITIAL TDRR

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
11	IRIG Temperature Deviation Voltage	volts	-3.25		+4.0		
12	PIPA Temperature Deviation Voltage	volts	-2.5		+2.5		
13	IRIG Temperature Deviation Voltage (after one hour)	volts	-3.25	( )	+4.0		
14	PIPA Temperature Deviation Voltage (after one hour)	volts	-2.5	( )	+2.5		
15	Temp Difference (absolute)	°F	0.00		2.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12615
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μ sec	0.25		0.75		
	Pulse Rise Time	μ sec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12615
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
43	4V Low Margin Test	volts dc					
		R2					
		other fail indications					
47	4V Voltage Fail Alarm (low)	volts dc	3.55		3.65		
51	4V High Margin Test	volts dc					
		R2					
		other fail indications					
55	4V Voltage Fail Alarm (high)	volts dc	4.3		4.7		
59	14V Low Margin Test	volts dc					
		R2					
		other fail indications					
63	14V Voltage Fail Alarm (low)	volts dc	12.4		12.8		
67	14V High Margin Test	volts dc					
		R2					
		other fail indications					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12615
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
71	14V Voltage Fail Test	volts dc	16.0		16.4		

JDC ITEM NO.	CALCULATIONS		
15	IRIG TEMP = Nominal IRIG TEMP + Deviation		
	Nominal IRIG TEMP indicating set point.	135.000 degrees	(a)
	Deviation (step 13 x 2 deg/volt)	+( )___.___	(b)
	IRIG TEMP (line a + Line b)	___.___degrees	(c)
	PIPA TEMP = Nominal PIPA Temp + Deviation		
	Nominal PIPA TEMP indicating set point.	130.000 degrees	(d)
	Deviation (Step 14 x 2 deg/volt)	+( )___.___	(e)
	PIPA TEMP (line d + Line e)	___.___	(f)
	Temp Difference = IRIG TEMP - PIPA TEMP = Line c - Line f		
	Line e	___.___degrees	
	Line f	___.___degrees	
	Temp Difference (Absolute)	___.___degrees	

DATE 15 MAR 66

JOB STANDBY CONTROL TEST

INITIAL TDRR 27134 D.S. PGS 4

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21 NOUN 10 ENTR

00013 ENTR

02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.

7. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.

lights are not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

2. IRIG Standby Temperature deviation CHANNEL 4-4 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and Calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier setting the CHART SPEEDS to 1 and the Range to 20 MV/MM on the Oscillograph Controls for CHANNELS 3 and 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."

2. CHANNEL 4 "start of Standby IRIG TEMP test."

8. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

9. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

LOW BUS TEMPERATURE CONTROL

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

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3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.
Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.

INPUT VOLTS RMS switch to 6

SLOPE switch to +

GATE switch to OPEN

TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration

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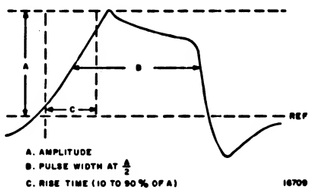
Equipment Console.

27. Disconnect cable W259 (2014470-011) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.

28. Connect a jumper from the remaining CLOCK connector on the Interface Signals patchboard to either 1 MEG input channel of the Oscilloscope on the CTS.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

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36. Perform the following DSKY operations:

a. RESET Press
b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 27 ENTR
d. 77767 ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RESET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

44. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v
b. 4.5v & 14.0v
c. 4.0v & 16.5v
d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group
MS35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts
02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. B INITIAL TDRR 302"1

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		2.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. B

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12615
REV. 11

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
49	No Fail Alarms						
50	Fail Alarms						

	CALCULATIONS	
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) $\frac{0.02V}{MM} \times \frac{2''}{V} = (\pm)$ + _____.____°	b
	MEAN PIPA TEMP (line a + line b) _____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degree	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) $\times \frac{0.02V}{MM} \times \frac{2''}{V} = + (\pm)$ _____.____°	e
	MEAN IRIG TEMP (line d + line f) _____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line of - line e	
	Line f _____.____°	
	Line e _____.____°	
	Temp Difference (absolute) _____.____°	

DATE 15 MAR 66

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:
   1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
   2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier setting the CHART SPEEDS to 1 and the Range to 50 mv/ mm on the Oscillograph control for CHANNEL 3 and the Range to 100 mv/ mm on the Oscillograph control for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:
   1. CHANNEL 3 "start of Standby PIPA TEMP test."
   2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/ SEC.

8. Press the PROCEED/ ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.
Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.

INPUT VOLTS RMS switch to 6

SLOPE switch to +

GATE switch to OPEN

TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration

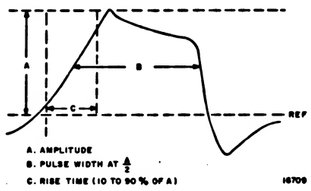
Equipment Console.

27. Disconnect cable W259 (2014470-011) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.

28. Connect a jumper from the remaining CLOCK connector on the Interface Signals patchboard to either 1 MEG input channel of the Oscilloscope on the CTS.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

36. Perform the following DSKY operations:

a. RESET Press
b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 27 ENTR
d. 77767 ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RESET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

44. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v
b. 4.5v & 14.0v
c. 4.0v & 16.5v
d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group
MS35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts
02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. C INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		2.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. C

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. C

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
49	No Fail Alarms						
50	Fail Alarms						

	CALCULATIONS	
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = (\pm)$ + _____.____°	b
	MEAN PIPA TEMP (line a + line b) _____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) $\times \frac{0.10V}{MM} \times \frac{2^\circ}{V} = + (\pm)$ _____.____°	e
	MEAN IRIG TEMP (line d + line e) _____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____.____°	
	Line c _____.____°	
	Temp Difference (absolute) _____.____°	

DATE 15 MAR 66

JOB STANDBY CONTROL TEST

INITIAL TDRR 27134 D.S. PGS 3

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscillograph control for CHANNEL 3 and 0.2 V/MM on the Oscillograph control for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."
2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

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3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration

DATE 15 MAR 66

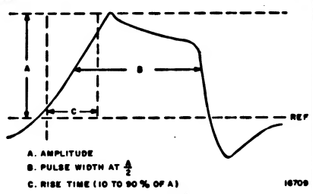
Equipment Console.

27. Disconnect cable W259 P6 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

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36. Perform the following DSKY operations:

a. RESET Press
b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 27 ENTR
d. 77767 ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.
b. RESET Press
c. VERB 61 ENTR
d. VERB 36 ENTR

44. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Adjust CONTROL 1 to set 4 volt supply to 4.0 VDC and adjust CONTROL 2 to set 14 volt supply to 14.0 VDC. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v
b. 4.5v & 14.0v
c. 4.0v & 16.5v
d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group
MS35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts
02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. D INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		2.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
49	No Fail Alarms						
50	Fail Alarms						

CALCULATIONS

14 MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean

Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees — a

Deviation of PIPA Mean.

(±) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = (\pm)$ + _____.____° — b

MEAN PIPA TEMP (line a + line b) _____.____° — c

MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN

Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees — d

Deviation of IRIG Mean

± No. MM (Between IRIG MEAN & Chart Zero) $\times \frac{0.2V}{MM} \times \frac{2^\circ}{V} = + (\pm)$ _____.____° — e

MEAN IRIG TEMP (line d + line e) _____.____° — f

15 Temp Difference = IRIG TEMP-PIPA TEMP
= line f - line c

Line f _____.____°

Line c _____.____°

Temp Difference (absolute) _____.____°

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21 NOUN 10 ENTR
00013 ENTR
02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:
   1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
   2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscillograph control for CHANNEL 3 and 0.2 V/MM on the Oscillograph control for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:
   1. CHANNEL 3 "start of Standby PIPA TEMP test."
   2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

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3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:
   DISPLAY TIME (N_2) to 10^5
   DISPLAY RESET to ZERO
   CLOCK FREQUENCY DIVIDER to 10
   CLOCK SELECTOR to INT
   FUNCTION to OFF
   INPUT SELECTOR to C SENSE
   SENSE SELECTOR to FWD
   TRIGGER VOLTAGE ATTN D to 10
   TRIGGER VOLTAGE to fully counterclockwise
   SAMPLE TIME (N_1) to 032000
   FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.
Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:
   FUNCTION switch to FREQ.
   INPUT VOLTS RMS switch to 6
   SLOPE switch to +
   GATE switch to OPEN
   TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration

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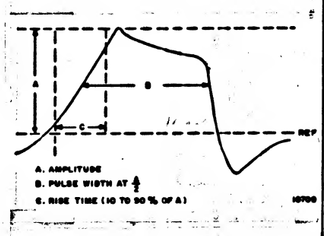
Equipment Console.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:
   a. Amplitude, volts peak-to-peak
   b. Width at 50% of amplitude
   c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

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36. Perform the following DSKY operations:

a. RESET Press
b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 27 ENTR
d. 77767 ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Deleted
44. Deleted

45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Adjust CONTROL 1 to set 4 volt supply to 4.0 VDC and adjust CONTROL 2 to set 14 volt supply to 14.0 VDC. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v
b. 4.5v & 14.0v
c. 4.0v & 16.5v
d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group
MS35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts
02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615
REV. E
INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		2.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

DATE 15 MAR 66

FORM 00146
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

DATE 15 MAR 66

FORM 00147
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
49	No Fail Alarms						
50	Fail Alarms						

CALCULATIONS

14 MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean

Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees — a

Deviation of PIPA Mean.
(±) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = + (\pm)$ _____.____° — b

MEAN PIPA TEMP (line a + line b) _____.____° — c

MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN

Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees — d

Deviation of IRIG Mean
± No. MM (Between IRIG MEAN & Chart Zero) $\times \frac{0.2V}{MM} \times \frac{2^\circ}{V} = + (\pm)$ _____.____° — e

MEAN IRIG TEMP (line d + line e) _____.____° — f

15 Temp Difference = IRIG TEMP-PIPA TEMP
= line f - line c

Line f _____.____°

Line c _____.____°

Temp Difference (absolute) _____.____°

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FORM 10157
Chg. 7-23-65

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:
   1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
   2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscillograph control for CHANNEL 3 and 0.2 V/MM on the Oscillograph control for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:
   1. CHANNEL 3 "start of Standby PIPA TEMP test."
   2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

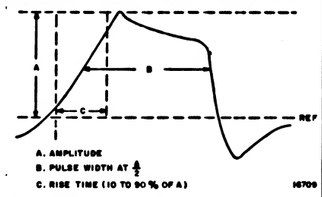
26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

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36. Perform the following DSKY operations:

a. RESET Press
b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 27 ENTR
d. 77767 ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Deleted

44. Deleted

45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Adjust CONTROL 1 to set 4 volt supply to 4.0 VDC and adjust CONTROL 2 to set 14 volt supply to 14.0 VDC. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v
b. 4.5v & 14.0v
c. 4.0v & 16.5v
d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group
MS35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts
02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. F INITIAL TDRR 30:71

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. F

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

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EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12615
REV. F

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
49	No Fail Alarms						
50	Fail Alarms						

	CALCULATIONS	
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = (\pm)$ + _____.____°	b
	MEAN PIPA TEMP (line a + line b) _____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) $\times \frac{0.2V}{MM} \times \frac{2^\circ}{V} = + (\pm)$ _____.____°	e
	MEAN IRIG TEMP (line d + line e) _____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____.____°	
	Line c _____.____°	
	Temp Difference (absolute) _____.____°	

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DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-
G	8-31-67	34455	1, 4-6	2,3	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present; enter VERB 36 and press RESET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00013 ENTR

c. 02000 ENTR

d. Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscillograph control for CHANNEL 3 and 0.2 V/MM on the Oscillograph control for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."
2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

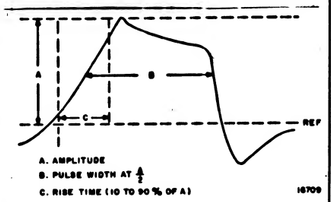
ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

LGC VOLTAGE MARGIN TEST

34. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

NOTE: Disregard PROG alarm which may occur in steps 35 through 37. If the alarm occurs it will be extinguished in step 38.

35. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

36. Set the VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

37. Set the VOLTAGE SELECT switch to AGC (+14V) +13V and adjust CONTROL 2 for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

38. Perform the following DSKY operations:

a. RESET Press
b. VERB 36 ENTR

39. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

40. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 27 ENTR
d. 77767 ENTR

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Using CONTROL 1, adjust the LGC 4 VDC supply voltage to 3.60 vdc. Using CONTROL 2, adjust the LGC 14 VDC supply voltage to 12.6 vdc and to 16.2 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.5 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.6 vdc and then to 16.2 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS TEST

43. Press INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel. The INHIBIT COMPUTER POWER FAIL pushbutton shall go out.

44. Adjust CONTROL 1 on CTS Power Control panel to set the LGC 4 VDC supply to 4.0 vdc. Adjust CONTROL 2 to set the LGC 14 VDC supply to 14.0 vdc. Monitor the CGC/LGC WARNING NO. 1 on the Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each step and press RESET pushbutton on the DSKY. All alarms shall go out within 60 seconds.

a. 3.5v and 14.0v
b. 4.5v and 14.0v
c. 4.0v and 16.5v
d. 4.0v and 12.6v

45. Set CONTROL 1 and CONTROL 2 switches on CTS Power Control panel to OFF.

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group
MS 35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

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EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. G INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. G

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	volts	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		

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EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. G

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
42	No Fail Alarms						
44	Fail Alarms						

CALCULATIONS

14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V}$ = + (±) ____.____°	b
	MEAN PIPA TEMP (line a + line b) ____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) $\times \frac{0.2V}{MM} \times \frac{2^\circ}{V}$ = + (±) ____.____°	e
	MEAN IRIG TEMP (line d + line e) ____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f ____.____°	
	Line c ____.____°	
	Temp Difference (absolute) ____.____°	

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JOB STANDBY CONTROL TEST

INITIAL TDRR 27134 D.S. PGS 3

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-
G	8-31-67	34455	1, 4-6	2,3	EA	-
H	2-15-68	35625	1,2,3,4,5	2,3	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present enter VERB 36 and press RESET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. 00013 ENTR

c. 02000 ENTR

d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscillograph control for CHANNEL 3 and 0.2 V/MM on the Oscillograph control for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."
2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

NOTE: CGC/LGC WARNING NO. 1 may light in step 9. Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that the AGC Calibration System has been calibrated within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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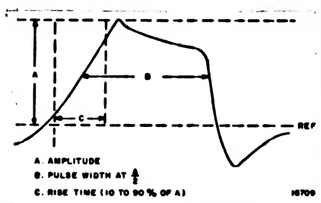
ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the printout.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



30. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.
b. VERB 36 ENTR
c. Press RSET pushbutton.
d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

RETICLE LAMP VOLTAGE

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record reticle lamp voltage when INCR RETICLE BRIGHTNESS control on Computer Control and Reticle Dimmer Assembly is set to maximum and minimum brightness positions.

+4 VDC LGC POWER SUPPLY

32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY

33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST

34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

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NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

38. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. 77767 ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 (±0.40) vdc.

42. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group
MS 35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. H INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE ____
SER. NO. ____ DWG ____ REV. ____

TEST HISTORY
DATE ____ START ____ END ____ SITE / LOCATION
TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. H

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.04		29.16		
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	volts	4.0		0.75		
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
31	Maximum brightness (absolute)	vdc	4.09		4.73		
	Minimum brightness (absolute)	vdc			0.3		
32	+4 VDC LGC power supply	volts	+3.80		+4.20		
33	+14 VDC LGC power supply	volts	+13.6		+14.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. H

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
40	No Fail Alarms						
43	Fail Alarms						

CALCULATIONS

14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____.____°	b
	MEAN PIPA TEMP (line a + line b) _____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____.____°	e
	MEAN IRIG TEMP (line d + line e) _____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____.____°	
	Line c _____.____°	
	Temp Difference (absolute) _____.____°	

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JOB STANDBY CONTROL TEST

INITIAL TDRR 27134 D.S. PGS 3

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-
G	8-31-67	34455	1, 4-6	2,3	EA	-
H	2-15-68	35625	1,2,3,4,5	2,3	EA	-
J	3-28-68	35980	1,2,3	2	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G/N TEST CONFIG indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present; enter VERB 36 and press RSET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

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b. 00013 ENTR

c. 02000 ENTR

d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3.

2. IRIG Standby Temperature deviation CHANNEL 4-3.

b. Insure that the CH 3 DC and CH 4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to .05 V/MM on the DC Amplifier for CHANNEL 3 and .2 V/MM on the DC Amplifier for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."

2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

NOTE: CGC/LGC WARNING NO. 1 may light in step 9. Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 CPS SUSPENSION POWER

18. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that the AGC Calibration System has been calibrated within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the printout.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

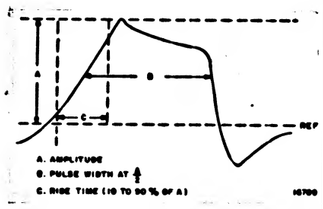
28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level

b. Width at 50% of amplitude

c. Rise time at 10 to 90% amplitude.



30. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. VERB 36 ENTR

c. Press RSET pushbutton.

d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

RETICLE LAMP VOLTAGE

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record reticle lamp voltage when INCR RETICLE BRIGHTNESS control on Computer Control and Reticle Dimmer Assembly is set to maximum and minimum brightness positions.

+4 VDC LGC POWER SUPPLY

32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY

33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST

34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

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NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

38. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. 77767 ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 (±0.40) vdc.

42. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group
MS 35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. J INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. J

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.04		29.16		
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	volts	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
31	Maximum brightness (absolute)	v dc	4.09		4.73		
	Minimum brightness (absolute)	v dc			0.3		
32	+4 VDC LGC power supply	volts	+3.80		+4.20		
33	+14 VDC LGC power supply	volts	+13.6		+14.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615 REV. J

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
40	No Fail Alarms						
43	Fail Alarms						

CALCULATIONS

14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____ . _____ °	b
	MEAN PIPA TEMP (line a + line b) _____ . _____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____ . _____ °	e
	MEAN IRIG TEMP (line d + line e) _____ . _____ °	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____ . _____ °	
	Line c _____ . _____ °	
	Temp Difference (absolute) _____ . _____ °	

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JOB STANDBY CONTROL TEST

INITIAL TDRR 27134 D.S. PGS 1

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-
G	8-31-67	34455	1, 4-6	2,3	EA	-
H	2-15-68	35625	1,2,3,4,5	2,3	EA	-
J	3-28-68	35980	1,2,3	2	EA	-
K	3-21-69	37440	3,4,5	2	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G/N TEST CONFIG indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present; enter VERB 36 and press RSET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

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b. 00013 ENTR

c. 02000 ENTR

d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3.

2. IRIG Standby Temperature deviation CHANNEL 4-3.

b. Insure that the CH 3 DC and CH 4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to .05 V/MM on the DC Amplifier for CHANNEL 3 and .2 V/MM on the DC Amplifier for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."

2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

NOTE: CGC/LGC WARNING NO. 1 may light in step 9. Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 CPS SUSPENSION POWER

18. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 052000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that JDC 04830 has been performed within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the printout.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

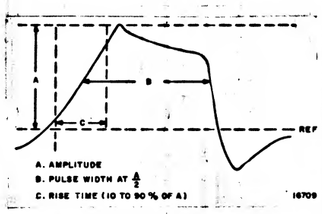
28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level

b. Width at 50% of amplitude

c. Rise time at 10 to 90% amplitude.



30. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. VERB 36 ENTR

c. Press RSET pushbutton.

d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

RETICLE LAMP VOLTAGE

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer (CCRD) assembly set to maximum.

31A. Verify and record that the dc voltage decreases when the INCR RETICLE BRIGHTNESS control is rotated to the minimum position.

31B. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control set to minimum.

+4 VDC LGC POWER SUPPLY

32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY

33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST

34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

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NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 (±0.40) vdc. _____

38. Perform following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	Observe:		
	VERB 21	NOUN 01	Flashing
c.	01357		ENTR
d.	00000		ENTR
e.	VERB 21	NOUN 01	ENTR
f.	Observe:		
	VERB 21	NOUN 01	Flashing
g.	01361		ENTR
h.	00000		ENTR
i.	NOUN 15		ENTR
j.	Observe:		
	VERB 21	NOUN 15	Flashing
k.	00000		ENTR ENTR
l.	00000		ENTR ENTR
m.	00000		ENTR ENTR
n.	00000		ENTR ENTR
o.	00000		ENTR ENTR
p.	00000		ENTR ENTR
q.	00000		ENTR
r.	VERB 21	NOUN 27	ENTR
s.	Observe:		
	VERB 21	NOUN 27	Flashing
t.	00010		ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 (±0.40) vdc.

42. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc _____
b. 4.6 vdc and 14.0 vdc _____
c. 4.0 vdc and 16.4 vdc _____
d. 4.0 vdc and 12.2 vdc _____

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group
MS 35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615
REV. K
INITIAL TDRR 27134

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615
REV. K

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.04		29.16		
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	volts	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
31	Reticle lamp voltage (maximum)	vac	2.14		2.46		
		vdc	-3.9		-4.5		
31A	Reticle lamp voltage decreases						
31B	Reticle lamp voltage (minimum)	vac			0.15		
		vdc			-0.26		
32	+4 VDC LGC power supply	volts	+3.80		+4.20		
33	+14 VDC LGC power supply	volts	+13.6		+14.4		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. K

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
40	No Fail Alarms						
43	Fail Alarms						

CALCULATIONS

14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) X( )$\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = (±) + _____.____°	b
	MEAN PIPA TEMP (line a + line b) _____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) X( )$\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____.____°	e
	MEAN IRIG TEMP (line d + line e) _____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____.____°	
	Line c _____.____°	
	Temp Difference (absolute) _____.____°	

DATE 15 MAR 68

FORM 0217
Orig. 7-23-65

JOB STANDBY CONTROL TEST | INITIAL TDRR 27134 D.S. PGS 3

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-
G	8-31-67	34455	1, 4-6	2,3	EA	-
H	2-15-68	35625	1,2,3,4,5	2,3	EA	-
J	3-28-68	35980	1,2,3	2	EA	-
K	3-21-69	37440	3,4,5	2	EA	-
L	5-26-70	38137	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G/N TEST CONFIG indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present enter VERB 36 and press RSET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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b. 00013 ENTR

c. 02000 ENTR

d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3.

2. IRIG Standby Temperature deviation CHANNEL 4-3.

b. Insure that the CH 3 DC and CH 4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to .05 V/MM on the DC Amplifier for CHANNEL 3 and .2 V/MM on the DC Amplifier for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."

2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

NOTE: CGC/LGC WARNING NO. 1 may light in step 9. Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 CPS SUSPENSION POWER

18. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that JDC 04830 has been performed within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the printout.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

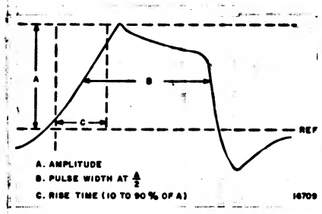
28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level

b. Width at 50% of amplitude

c. Rise time at 10 to 90% amplitude.



30. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. VERB 36 ENTR

c. Press RSET pushbutton.

d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

RETICLE LAMP VOLTAGE

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer (CCRD) assembly set to maximum.

31A. Verify and record that the dc voltage decreases when the INCR RETICLE BRIGHTNESS control is rotated to the minimum position.

31B. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control set to minimum.

+4 VDC LGC POWER SUPPLY

32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY

33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST

34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

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NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 01357 ENTR
d. 00000 ENTR
e. VERB 21 NOUN 01 ENTR
f. Observe:
VERB 21 NOUN 01 Flashing
g. 01361 ENTR
h. 00000 ENTR
i. NOUN 15 ENTR
j. Observe:
VERB 21 NOUN 15 Flashing
k. 00000 ENTR ENTR
l. 00000 ENTR ENTR
m. 00000 ENTR ENTR
n. 00000 ENTR ENTR
o. 00000 ENTR ENTR
p. 00000 ENTR ENTR
q. 00000 ENTR
r. VERB 21 NOUN 27 ENTR
s. Observe:
VERB 21 NOUN 27 Flashing
t. 00010 ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 (±0.40) vdc.

42. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group
MS 35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. L INITIAL TDRR 27134

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

DATE 15 MAR 66

FORM 101 6
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. L

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.04		29.16		
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	volts	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
31	Reticle lamp voltage (maximum)	vac	2.14		2.46		
		vdc	-3.9		-4.5		
31A	Reticle lamp voltage decreases						
31B	Reticle lamp voltage (minimum)	vac			0.15		
		vdc			-0.26		
32	+4 VDC LGC power supply	volts	+3.80		+4.20		
33	+14 VDC LGC power supply	volts	+13.6		+14.4		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. L

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
40	No Fail Alarms						
43	Fail Alarms						

	CALCULATIONS	
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = (±) + _____ . _____ °	b
	MEAN PIPA TEMP (line a + line b) _____ . _____ °	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____ . _____ °	e
	MEAN IRIG TEMP (line d + line e) _____ . _____ °	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____ . _____ °	
	Line c _____ . _____ °	
	Temp Difference (absolute) _____ . _____ °	

DATE 15 MAR 66

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29400	1,2,3,4,7	1,2,4	MM	ACM
B	7-21-66	30271	1,2,5	1,3,4	EA	MB
C	8-4-66	30517	1,2	4	EA	-
D	11-10-66	31901	2,3,4,6	2,3	EA	-
E	11-25-66	32061	4,5	-	EA	-
F	7-27-67	34233	1	1	EA	-
G	8-31-67	34455	1, 4-6	2,3	EA	-
H	2-15-68	35625	1,2,3,4,5	2,3	EA	-
J	3-28-68	35980	1,2,3	2	EA	-
K	3-21-69	37440	3,4,5	2	EA	-
L	5-26-70	38137	1	-	EA	-
M	7-6-70	38176	3, 5	-	EA	-

REFERENCES PS 6015000

IMPORTANT see below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscillograph sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G/N TEST CONFIG indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present enter VERB 36 and press RSET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00013 ENTR

c. 02000 ENTR

d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscillograph as follows:

a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3.
2. IRIG Standby Temperature deviation CHANNEL 4-3.

b. Insure that the CH 3 DC and CH 4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to .05 V/MM on the DC Amplifier for CHANNEL 3 and .2 V/MM on the DC Amplifier for CHANNEL 4.

d. Mark the Oscillograph Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."
2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

NOTE: CGC/LGC WARNING NO. 1 may light in step 9. Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record Indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 CPS SUSPENSION POWER

18. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) to 10^5
DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10
CLOCK SELECTOR to INT
FUNCTION to OFF
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
TRIGGER VOLTAGE ATTN D to 10
TRIGGER VOLTAGE to fully counterclockwise
SAMPLE TIME (N_1) to 032000
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that JDC 04830 has been performed within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.
INPUT VOLTS RMS switch to 6.4
SLOPE switch to +
GATE switch to OPEN
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

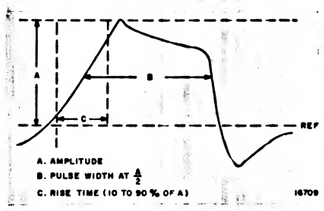
ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the printout.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.



30. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.
b. VERB 36 ENTR
c. Press RSET pushbutton.
d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

RETICLE LAMP VOLTAGE

31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer (CCRD) assembly set to maximum.

31A. Verify and record that the dc voltage decreases when the INCR RETICLE BRIGHTNESS control is rotated to the minimum position.

31B. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control set to minimum.

+4 VDC LGC POWER SUPPLY

32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY

33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST

34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor +4 VDC LGC power supply voltage on DVM. Adjust CONTROL 1 on Power Control panel until DVM indicates 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set CROSSBAR CONTROL on Primary Signal Selector panel to 293 to monitor +14 VDC LGC power supply voltage on DVM. Adjust Control 2 on Power Control panel until DVM indicates 14.0 (±0.40) vdc.

38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 01357 ENTR
d. 00000 ENTR
e. VERB 21 NOUN 01 ENTR
f. Observe:
VERB 21 NOUN 01 Flashing
g. 01361 ENTR
h. 00000 ENTR
i. NOUN 15 ENTR
j. Observe:
VERB 21 NOUN 15 Flashing
k. 00000 ENTR ENTR
l. 00000 ENTR ENTR
m. 00000 ENTR ENTR
n. 00000 ENTR ENTR
o. 00000 ENTR ENTR
p. 00000 ENTR ENTR
q. 00000 ENTR
r. VERB 21 NOUN 27 ENTR
s. Observe:
VERB 21 NOUN 27 Flashing
t. 00010 ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

NOTE: During the performance of steps 40 through 43, set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor +4 VDC LGC power supply voltage on the DVM, and set CROSSBAR CONTROL to 293 to monitor the +14 VDC LGC power supply voltage on the DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc.

Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to 16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 (±0.20) vdc. Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 (±0.40) vdc.

42. Press to extinguish INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc
b. 4.6 vdc and 14.0 vdc
c. 4.0 vdc and 16.4 vdc
d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. +00000 ENTR

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group
MS 35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

and

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12615 REV. M INITIAL TDRR 27134

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	°F	129.0		132.0		
	Mean IRIG temp (one hour	°F					
15	Mean Temperature Difference (absolute)	°F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12615 REV. M

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.04		29.16		
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300		
	Printout 2	cps	XXXX2399700		XXXX2400300		
	Printout 3	cps	XXXX2399700		XXXX2400300		
	Printout 4	cps	XXXX2399700		XXXX2400300		
	Printout 5	cps	XXXX2399700		XXXX2400300		
	Printout 6	cps	XXXX2399700		XXXX2400300		
	Printout 7	cps	XXXX2399700		XXXX2400300		
	Printout 8	cps	XXXX2399700		XXXX2400300		
	Printout 9	cps	XXXX2399700		XXXX2400300		
29	Pulse Amplitude	volts	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
31	Reticle lamp voltage (maximum)	vac	2.14		2.46		
		vdc	-3.9		-4.5		
31A	Reticle lamp voltage decreases						
31B	Reticle lamp voltage (minimum)	vac			0.15		
		vdc			-0.26		
32	+4 VDC LGC power supply	volts	+3.80		+4.20		
33	+14 VDC LGC power supply	volts	+13.6		+14.4		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12615
REV. M

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
40	No Fail Alarms						
43	Fail Alarms						

CALCULATIONS

14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean	
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees	a
	Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = (±) + _____.____°	b
	MEAN PIPA TEMP (line a + line b) _____.____°	c
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN	
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees	d
	Deviation of IRIG Mean ± No. MM (Between IRIG MEAN & Chart Zero) X( ) $\frac{V}{MM}$ X $\frac{2^\circ}{V}$ = + (±) _____.____°	e
	MEAN IRIG TEMP (line d + line e) _____.____°	f
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c	
	Line f _____.____°	
	Line c _____.____°	
	Temp Difference (absolute) _____.____°	

DATE 15 MAR 66

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

7. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.

8. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

9. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

10. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.

LOW BUS TEMPERATURE CONTROL

11. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG Temperature voltage indicated on the DVM.

12. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA Temperature voltage indicated on the DVM.

13. After one hour, set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG temperature voltage indicated on the DVM.

14. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA temperature voltage indicated on the DVM.

15. Calculate the difference between the IRIG and Accelerometer voltages measured in steps 13 and 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

- DISPLAY TIME (N_2) to 10^5
- DISPLAY RESET to ZERO
- CLOCK FREQUENCY DIVIDER to 10
- CLOCK SELECTOR to INT
- FUNCTION to OFF
- INPUT SELECTOR to C SENSE
- SENSE SELECTOR to FWD
- TRIGGER VOLTAGE ATTN D to 10
- TRIGGER VOLTAGE to fully counterclockwise
- SAMPLE TIME (N_1) to 032000
- FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000. Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

DATE _____

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

- FUNCTION switch to FREQ.
- INPUT VOLTS RMS switch to 102
- SLOPE switch to +
- GATE switch to OPEN
- TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W207 (1020253) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

27. Disconnect cable W207 (1020253) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.

28. Connect a jumper from the remaining CLOCK connector on the Interface Signals patchboard to either 1 MEG input channel of the Oscilloscope on the CTS.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak
b. Width at 50% of amplitude
c. Rise time at 10 to 90% amplitude.

+4 VDC LGC POWER SUPPLY

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM. _____

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC. Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS _____

DATE _____

control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

36. Perform the following DSKY operations:

a. RESET	Press
b. VERB 36	ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to OFF.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (±0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 27	ENTR
d. 77767		ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

LGC +4 VDC VOLTAGE MARGIN TEST (low)

NOTE: Do not adjust below 2.5 volts in the following step.

43. Using the 4V control, reduce the LGC 4V output by 150 mvdc. After 150 seconds observe the CGC/LGC WARNING lamp on the Monitor panel. If the CGC/LGC WARNING lamp is lighted, record the DVM indication, DSKY Row 2 indication and any other LGC fail alarms that are present. If the CGC/LGC WARNING lamp is not lighted, repeat the above procedure until the CGC/LGC WARNING lamp lights or the DVM indicates 2.5 vdc. If no alarms occur record "None" on the data sheet.

DATE _____

44. Readjust the 4V control until the LGC 4VDC output is 4.0 (±0.15) vdc.

45. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL lamp and all alarms shall go out.

46. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

+4 VDC VOLTAGE FAIL TEST (low)

NOTE: Do not adjust below 2.5 volts in the following step.

47. Using the 4V control, slowly reduce the LGC 4V output until the CGC/LGC WARNING lamp on the Monitor panel is lighted. Record the DVM indication.

48. Readjust the 4V control until the LGC 4VDC output is at 4 (±0.15) vdc.

49. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL pushbutton shall light and all alarms shall go out.

50. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

+4 VDC VOLTAGE MARGIN TEST (high)

NOTE: Do not adjust above 5.2 volts in the following step.

51. Using the 4V control, increase the LGC 4V output by 150 mvdc. After 150 seconds observe the CGC/LGC WARNING lamp on the Monitor panel. If the CGC/LGC WARNING lamp is lighted, record the DVM indication, DSKY Row 2 indication and any other LGC fail alarms that are present. If the CGC/LGC WARNING lamp is not lighted, repeat the above procedure until the CGC/LGC WARNING lamp lights or the DVM indicates 5.2 vdc. If no alarms occur record "None" on the data sheet.

52. Readjust the 4V control until the LGC 4V output is at 4 (±0.15) vdc.

53. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL lamp and all alarms shall go out.

54. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

DATE _____

LGC + 4 VDC VOLTAGE FAIL TEST (high)

NOTE: Do not adjust above 5.2 volts in the following step.

55. Using the 4V control, slowly increase the LGC 4VDC output until the CGC/LGC WARNING lamp on the Monitor panel lights. Record the DVM indication.

56. Readjust the 4V control until the LGC 4VDC output is at 4.0 (±0.15) vdc.

57. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL pushbutton shall light and all alarms shall go out.

58. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

LGC + 14 VDC VOLTAGE MARGIN TEST (low)

NOTE: Do not adjust below 8.0 vdc in the following step.

59. Using the 14V control, reduce the LGC 14V output by 0.5 vdc. After 150 seconds observe the CGC/LGC WARNING lamp on the Monitor panel. If the CGC/LGC WARNING lamp is lighted, record the DVM indication, DSKY Row 2 indication and any other LGC fail alarms that are present. If the CGC/LGC WARNING lamp is not lighted, repeat the above procedure until the CGC/LGC WARNING lamp lights or the DVM indicates 8.0 vdc. If no alarms occur record "None" on the data sheet.

60. Readjust the 14V control until the LGC 14V output is at 14 (±0.2) vdc.

61. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL lamp and all alarms shall go out.

62. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

LGC + 14 VDC VOLTAGE FAIL TEST (low)

NOTE: Do not adjust below 8.0 volts in the following step.

63. Using the 14V control, slowly reduce the LGC 14V output until the CGC/LGC WARNING lamp on the Monitor panel is lighted. Record the DVM indication.

64. Readjust the 14V control until the 14VDC output is 14 (±0.2) vdc.

65. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL pushbutton shall light and all alarms shall go out.

DATE _____

66. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

LGC + 14 VDC VOLTAGE MARGIN TEST (high)

NOTE: Do not adjust above 16.5 volts in the following step.

67. Using the 14V control increase the LGC 14V output by 0.5 vdc. After 150 seconds observe the CGC/LGC WARNING lamp on the Monitor panel. If the CGC/LGC WARNING lamp is lighted, record the DVM indication, DSKY Row 2 indication and any other LGC fail alarms that are present. If the CGC/LGC WARNING lamp is not lighted repeat the above procedure until the CGC/LGC WARNING lamp lights or the DVM indicates 16.5 vdc. If no alarms occur record "None" on the data sheet.

68. Readjust the 14V control until the LGC 14V output is 14 (±0.2) vdc.

69. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel and the RESET pushbutton on the DSKY. The INHIBIT COMPUTER POWER FAIL lamp and all alarms shall go out.

70. Perform the following DSKY operations:

VERB 36		ENTR
VERB 57		ENTR
00015		ENTR
VERB 21	NOUN 27	ENTR
77767		ENTR

LGC + 14 VDC VOLTAGE FAIL TEST (high)

NOTE: Do not adjust above 16.5 volts in the following step.

71. Using the 14V control, slowly increase the LGC 14VDC output until the GCG/LGC WARNING lamp on the Monitor panel lights. Record the DVM indication.

72. Readjust the 14V control until the LGC 14V output is at 14 (±0.2) vdc.

73. Perform the following DSKY operations:

RESET	Press
VERB 36	ENTR

74. Set the 4V and 14V switches on the Power Control panel to OFF.

75. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

76. Upon completion of the data sheet, make a copy of the data sheet and forward immediately to:

Digital Development Group
MS35
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Mass. 02142

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12615
REV. -
INITIAL TDRR _____

JOB STANDBY CONTROL TEST

TDRR 27134 MAR 13 1968

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
10	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
11	IRIG Temperature	volts	-3.25		+4.0		
12	PIPA Temperature	volts	-2.5		+2.5		
13	IRIG Temperature (after one	volts	-3.25	( )	+4.0		
14	PIPA Temperature (after one hour)	volts	-2.5	( )	+2.5		
15	Calculated difference between IRIG & PIPA voltages	volts			0.5		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12615
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
43	4V Low Margin Test	volts dc					
		R2					
		other fail indications					
47	4V Voltage Fail Alarm (low)	volts dc	3.55		3.65		
51	4V High Margin Test	volts dc					
		R2					
		other fail indications					
55	4V Voltage Fail Alarm (high)	volts dc	4.3		4.7		
59	14V Low Margin Test	volts dc					
		R2					
		other fail indications					
63	14V Voltage Fail Alarm (low)	volts dc	12.4		12.8		
67	14V High Margin Test	volts dc					
		R2					
		other fail indications					

DATE _____

FORM 0011
Chg. 7-

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12615
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
20	Counter indication	counts	099968		100032		
21	3200 cps 28V feedback voltage	volts	28.03		29.17		
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003		
	Printout 2	cps	1023997		1024003		
	Printout 3	cps	1023997		1024003		
	Printout 4	cps	1023997		1024003		
	Printout 5	cps	1023997		1024003		
	Printout 6	cps	1023997		1024003		
	Printout 7	cps	1023997		1024003		
	Printout 8	cps	1023997		1024003		
	Printout 9	cps	1023997		1024003		
29	Pulse Amplitude	vp-p	4.0				
	Pulse Width	μsec	0.25		0.75		
	Pulse Rise Time	μsec			0.2		
30	+4 VDC LGC power supply	volts	+3.85		+4.15		
31	+14 VDC LGC power supply	volts	+13.8		+14.2		
32	Maximum brightness	v dc	4.09		4.73		
	Minimum brightness	v dc			0.3		

DATE _____

FORM 0011
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12615
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
71	14V Voltage Fail Test	volts dc	16.0		16.4		

DATE _____

FORM 0011
Chg.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide DSKY illumination. The pushbuttons shall light.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

10. Perform the following DSKY operations and record the displayed indications:

a. VERB 11 NOUN 10 ENTR

b. 00030 ENTR

c. 5 _____ displayed

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Simultaneously press the EVENT MARKER on the Oscillograph Control panel and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 5____ to 7____.

14. Stop the Oscillograph and record the elapsed time between EVENT MARKERS.

15. Perform the following DSKY operations and record the displayed indications:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

c. 4 _____ displayed

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +22500 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +22500

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +22500 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 +225 __
Row 2 +225 __
Row 3 +225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to

CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, 5, and 6 on the Oscillograph Amplifier.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to 20 MV/MM on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00030 ENTR

c. 5 ____ displayed

28. Insure that at least 30 minutes have elapsed since the time recorded in step 18 and that the ISS has been in STANDBY during that period.

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 5 ____ to 7____.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 5 ____ to 7 ____.

34. After the DSKY display changes from 5 ____ to 7 ____, perform the following DSKY operation:

a. VERB 11 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142

e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time.

39. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG Temperature voltage indicated on the DVM.

40. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA Temperature voltage indicated on the DVM.

41. Obtain the stabilized PIPA STANDBY temperature from the STANDBY CONTROL TEST and compare with PIPA Temp. measured in step 40. Calculate and record difference.

800 CPS P/S THERMISTOR

42. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

43. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

44. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

45. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 21 Flashing

c. Enter +00500 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00500 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00500 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

46. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

47. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

48. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11	NOUN 10	ENTR
00012		ENTR

49. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

50. One hour after performing step 38, press the EVENT MARKER on the Oscillograph Control Panel, record the time, and stop the Oscillograph.

51. Record the following deviations:

a. The maximum and minimum voltage deviation on CHANNEL 3 between the voltages marked in step 38 to step 51.

b. The maximum and minimum voltage deviation on CHANNEL 4 between the voltage marked in step 38 to step 51.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 6.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter		
VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. Enter	+00000	ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. Enter	+00000	
f. Observe		
VERB 23	NOUN 22	Flashing
g. Enter	+00000	
h. Enter		
VERB 16	NOUN 20	ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. A INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.75				28.25		
10	Row 1		5___				5___		
14	Elapsed time	sec	85				95		
15	Row 1		4___				4___		
18	Time	hr min							
28	Elapsed time	min	30						
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. A

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
39	IRIG temperature	volts	-1.0				+1.0		
40	PIPA temperature	volts	-1.0				+1.0		
41	PIPA STANDBY temperature	volts							
	Step 40 - step 41 = | |	volts					0.25		
42	800 CPS/PS temperature	ohms	12210				18,370		
43	Temp Mon 1	ohms	11400				23,250		
44	PIPA Cal. Mod.	ohms	13650				23,250		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. A

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
47	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
49	Row 1 display		xxxxx				xxxxx		
50	Time	hr min							
51	Voltage Deviation Step 38 - Step 51 = | | CHANNEL 3	vdc					0.200		
	Voltage Deviation Step 38 - Step 51 = | | CHANNEL 4	vdc					0.200		
52	Maximum (ON state) CHANNEL 5 voltage	vdc	27				29		
	Minimum (OFF state) CHANNEL 5 voltage	vdc	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

JOB OPERATE CONTROL TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Insure that the PROCEED lamp on the PROCEED/ISS STANDBY pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

10. Perform the following DSKY operations and record the displayed indications:

a. VERB 11 NOUN 10 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

b. 00030 ENTR

c. 2 _____ displayed

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Simultaneously press the EVENT MARKER on the Oscillograph Control panel and the PROCEED/ISS OPERATE pushbutton on the Test Control panel. The DSKY display shall change from 2 ____ to 0 ____.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012 ENTR

c. 0 ____ displayed

14. Press the EVENT MARKER on the oscillograph control panel immediately after the DSKY display changes from 0____ to 4____.

15. Stop the Oscillograph and record the elapsed time between EVENT MARKERS.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +22500 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +22500

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +22500 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 +225 __
Row 2 +225 __
Row 3 +225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.

b. IRIG Temperature on CHANNEL 4-3DC.

c. IMU Heater Discrete on CHANNEL 5 AUX

d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to

DATE 15 MAR 66

CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, 5, and 6 on the Oscillograph Amplifier.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to 20 MV/MM on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00030 ENTR

c. 5 ____ displayed

28. Insure that at least 30 minutes have elapsed since the time recorded in step 18 and that the ISS has been in STANDBY during that period.

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 5 ____ to 7____.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 5 ____ to 7 ____.

34. After the DSKY display changes from 5 ____ to 7 ____, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142

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e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time.

39. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG Temperature voltage indicated on the DVM.

40. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA Temperature voltage indicated on the DVM.

41. Obtain the stabilized PIPA STANDBY temperature from the STANDBY CONTROL TEST and compare with PIPA Temp. measured in step 40. Calculate and record difference.

800 CPS P/S THERMISTOR

42. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

43. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

44. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

45. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 21 Flashing

c. Enter +00500 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00500 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00500 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

46. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

47. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

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48. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11	NOUN 10	ENTR
00012		ENTR

49. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

50. One hour after performing step 38, press the EVENT MARKER on the Oscillograph Control Panel, record the time, and stop the Oscillograph.

51. Record the following deviations:

a. The maximum and minimum voltage deviation on CHANNEL 3 between the voltages marked in step 38 to step 51.

b. The maximum and minimum voltage deviation on CHANNEL 4 between the voltage marked in step 38 to step 51.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 6.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter		
VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. Enter	+00000	ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. Enter	+00000	
f. Observe		
VERB 23	NOUN 22	Flashing
g. Enter	+00000	
h. Enter		
VERB 16	NOUN 20	ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. B INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.75				28.25		
10	Row 1		5___				5___		
14	Elapsed time	sec	85				95		
15	Row 1		4___				4___		
13	Time	hr min							
28	Elapsed time	min	30						
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. B

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
39	IRIG temperature	volts	-1.0				+1.0		
40	PIPA temperature	volts	-1.0				+1.0		
41	PIPA STANDBY temperature	volts							
	Step 40 - step 41 = | |	volts					0.25		
42	800 CPS/PS temperature	ohms	12210				18,370		
43	Temp Mon 1	ohms	11400				23,250		
44	PIPA Cal. Mod.	ohms	13650				23,250		

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. B

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
47	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
49	Row 1 display		xxxox				xxxox		
50	Time	hr min							
51	Voltage Deviation Step 38 - Step 51 = | | CHANNEL 3	vdc					0.200		
	Voltage Deviation Step 38 - Step 51 = | | CHANNEL 4	vdc					0.200		
52	Maximum (ON state) CHANNEL 5 voltage	vdc	27				29		
	Minimum (OFF state) CHANNEL 5 voltage	vdc	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel.

10. Deleted.

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Simultaneously press the EVENT MARKER on the Oscillograph Control panel and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Press the EVENT MARKER on the oscillograph control panel immediately after the DSKY display changes from 0____to 4____.

15. Stop the Oscillograph and record the elapsed time between EVENT MARKERS.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 + 225 __
Row 2 + 225 __
Row 3 + 225 __

Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers fromTPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Step 32 and 50 take precidence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 00000 displayed

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Insure that at least 30 minutes have elapsed since the time recorded in step 18 and that the ISS has been in STANDBY during that period.

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

39. 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 21 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00000

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00000

h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12616 JDC
REV. C
INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.75				28.25		
15	Elapsed time	sec	85				95		
18	Time	hr min							
27	CHANNEL 3 Voltage	VDC							
	CHANNEL 4 Voltage	VDC							
28	Elapsed time	min	30						
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616
REV. C

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	CHANNEL 3 Voltage	VDC							
39	Time	min							
	CHANNEL 4 Voltage	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		XXXXX				XXXXX		
48	CHANNEL 3 Voltage	VDC	-0.5				+0.5		
	CHANNEL 4 Voltage	VDC	-0.75				+0.75		
49	| Step 27 | - Step 48 |	VDC					0.25		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12613 REV. C

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 +225 __
Row 2 +225 __
Row 3 +225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers fromTPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

DATE 15 MAR 66

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Step 32 and 50 take precidence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 00000 displayed

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Insure that at least 30 minutes have elapsed since the time recorded in step 18 and that the ISS has been in STANDBY during that period.

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

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1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

39. 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 21 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

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Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00000

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00000

h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. D INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.75				28.25		
15	Elapsed time	sec	85				95		
18	Time	hr							
		min							
27	CHANNEL 3 Voltage	VDC							
	CHANNEL 4 Voltage	VDC							
28	Elapsed time	min	30						
31	Time	hr							
		min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 00119
Chg. 2-28-66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. D

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	CHANNEL 3 Voltage	VDC							
39	Time	min							
	CHANNEL 4 Voltage	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxox				xxxox		
48	CHANNEL 3 Voltage	VDC	-0.5				+0.5		
	CHANNEL 4 Voltage	VDC	-0.75				+0.75		
49	| Step 27 | - Step 48 |	VDC					0.25		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 00119
Chg. 2-28-66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. D

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 + 225 __
Row 2 + 225 __
Row 3 + 225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Deleted.

29. Deleted.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

39. 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00000

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00000

h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. E INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.75				28.25		
15	Elapsed time	sec	85				95		
18	Time	hr min							
27	CHANNEL 3 Voltage	VDC							
	CHANNEL 4 Voltage	VDC							
28	Elapsed time	min	30						
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. E

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35	MG DSKY position								
(cont)	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	CHANNEL 3 Voltage	VDC							
39	Time	min							
	CHANNEL 4 Voltage	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display								
48	CHANNEL 3 Voltage	VDC	-0.5				+0.5		
	CHANNEL 4 Voltage	VDC	-0.75				+0.75		
49	| Step 27 | - Step 48 |	VDC					0.25		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616
REV. E

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 +225 __
Row 2 +225 __
Row 3 +225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

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24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Deleted.

29. Deleted.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

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1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

39. 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

DATE 15 MAR 66

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 +225 __
Row 2 +225 __
Row 3 +225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

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24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Deleted.

29. Deleted.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

DATE 15 MAR 66

1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

39. 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

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Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00000 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. F INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr							
		min							
27	CHANNEL 3 Voltage	VDC							
	CHANNEL 4 Voltage	VDC							
31	Time	hr							
		min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

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Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	CHANNEL 3 Voltage	VDC							
39	Time	min							
	CHANNEL 4 Voltage	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx				xxxxx		
48	CHANNEL 3 Voltage	VDC	-0.5				+0.5		
	CHANNEL 4 Voltage	VDC	-0.75				+0.75		
49	| Step 27 | - | Step 48 |	VDC					0.50		

* TO BE USED AS REQUIRED OR DESIRED

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Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00000 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. F INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr							
		min							
27	CHANNEL 3 Voltage	VDC							
	CHANNEL 4 Voltage	VDC							
31	Time	hr							
		min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 00149
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	CHANNEL 3 Voltage	VDC							
39	Time	min							
	CHANNEL 4 Voltage	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx				xxxxx		
48	CHANNEL 3 Voltage	VDC	-0.5				+0.5		
	CHANNEL 4 Voltage	VDC	-0.75				+0.75		
49	| Step 27 | - | Step 48 |	VDC					0.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 00149
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC
NO. 12616
REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 901-0
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 00150
Chg. 7-23-65

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WSH
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
G	3-30-67	33468	1	2	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 + 225 __
Row 2 + 225 __
Row 3 + 225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

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24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Deleted.

29. Deleted.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

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1X SIN AND COS SIGNALS

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.

39. 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

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Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR

b. Observe
VERB 21 NOUN 22 Flashing

c. Enter +00000 ENTR

d. Observe
VERB 22 NOUN 22 Flashing

e. Enter +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing

g. Enter +00000 ENTR

h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. G INITIAL TDRR 271:4

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
27	CHANNEL 3 Voltage	VDC							
	CHANNEL 4 Voltage	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. G

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	CHANNEL 3 Voltage	VDC							
39	Time	min							
	CHANNEL 4 Voltage	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display								
48	CHANNEL 3 Voltage	VDC	-0.5				+1.0		
	CHANNEL 4 Voltage	VDC	-1.25				+1.25		
49	| Step 27 | - | Step 48 |	VDC					0.50		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 126 6
REV. G

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

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DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
(M) G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1,3,4,5	1,2	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and monitor panel of CTS.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 + 225 __
Row 2 + 225 __
Row 3 + 225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6

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AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers fromTPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

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31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod.

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thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR
00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record

the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00000 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12616 JDC
REV. H
INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616
REV. H

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position								
	IG DSKY position								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx (xxx3x)*				xxxxx (xxx3x)*		
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616
REV. H

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48 (cont)	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1,3,4,5	1,2	EA	-
J	8-31-67	34456	-	1,2	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and monitor panel of CTS.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

17. When the DSKY registers display (approx):

Row 1 + 225 __
Row 2 + 225 __
Row 3 + 225 __

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

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31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod.

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thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00500 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00500 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00500 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR
00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record

the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter
VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. Enter +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. Enter +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. Enter +00000 ENTR
h. Enter
VERB 16 NOUN 20 ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. J INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position (Row 1)								

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. J

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (Row 3)								
	IG DSKY position (Row 2)								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx (xxx3x)*				xxxxx (xxx3x)*		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616
REV. J

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		
	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

* TO BE USED AS REQUIRED OR DESIRED

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FORM 0 0150
Chg. 7 - 3-65

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1,3,4,5	1,2	EA	-
J	8-31-67	34456	-	1,2	EA	-
K	3-28-68	35979	All	2,3	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the PRO (or STBY) pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

17. When the DSKY registers display:

Row 1 +22500 ±00500
Row 2 +22500 ±00500
Row 3 +22500 ±00500

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.
b. IRIG Temperature on CHANNEL 4-3.
c. IMU Heater Discrete on CHANNEL 5-15.
d. IMU Blower Discrete on CHANNEL 6-15.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed 15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.

TURN-ON CAGE TEST AND CDU AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

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31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod.

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thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00500		ENTR
h. VERB 16	NOUN 20	ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11	NOUN 10	ENTR
00012		ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature

recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR
i. VERB 16	NOUN 20	ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. K INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position (Row 1)								

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. K

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (Row 3)								
	IG DSKY position (Row 2)								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx ** (xxx3x)				xxxxx ** (xxx3x)		

* To be used as required or desired
** MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616
REV. K

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		
	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5		
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2				30.8		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0				+5.0		

* TO BE USED AS REQUIRED OR DESIRED

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DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1,3,4,5	1,2	EA	-
J	8-31-67	34456	-	1,2	EA	-
K	3-28-68	35979	All	2,3	EA	-
L	4-9-68	36043	1	-	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedure.

4. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 0____ displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0____ to 4____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

17. When the DSKY registers display:
Row 1 +22500 ±00500
Row 2 +22500 ±00500
Row 3 +22500 ±00500
Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor

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the following signals:

a. Accel Temperature on CHANNEL 3-3.
b. IRIG Temperature on CHANNEL 4-3.
c. IMU Heater Discrete on CHANNEL 5-15.
d. IMU Blower Discrete on CHANNEL 6-15.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-23 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed 15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.

TURN-ON CAGE TEST AND CDU AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

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31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. +00000 ENTR
c. +00000 ENTR
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod.

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thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00500		ENTR
h. VERB 16	NOUN 20	ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11	NOUN 10	ENTR
00012		ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature

recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR
i. VERB 16	NOUN 20	ENTR

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. L INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position (Row 1)								

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. L

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (Row 3)								
	IG DSKY position (Row 2)								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		XXXXX ** (XXX3X)				XXXXX ** (XXX3X)		

* To be used as required or desired
** MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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FORM 00150
Chg. 23-5

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616
REV 1.

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		
	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5		
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2				30.8		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0				+5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 0115
Chg. 1 - 3-65

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1,3,4,5	1,2	EA	-
J	8-31-67	34456	-	1,2	EA	-
K	3-28-68	35979	All	2,3	EA	-
L	4-9-68	36043	1	-	EA	-
M	7-15-68	36548	All	3	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding with this JDC.

2. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

3. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

4. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedure.

5. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00012		ENTR
c.	Observe:		
	0 _____		displayed in Row 1

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 _____ to 4 _____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+09000		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+09000		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+09000		ENTR
h.	VERB 16	NOUN 20	ENTR

NOTE: If LGC contains Aurora 85 test ropes, NO ATT lamp on DSKY will not light in step 17.

17. When the DSKY registers display:

Row 1 +09000 ±00500
Row 2 +09000 ±00500
Row 3 +09000 ±00500

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and

the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.
b. IRIG Temperature on CHANNEL 4-3.
c. IMU Heater Discrete on CHANNEL 5-15.
d. IMU Blower Discrete on CHANNEL 6-15.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-23 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed 15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.

TURN-ON CAGE TEST AND CDU AMBIGUITY TEST

27. Perform the following DSKY operations:

a.	VERB 11	NOUN 10	ENTR
b.	00012		ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and

monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a.	VERB 16	NOUN 20	ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest

usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00500		ENTR
h. VERB 16	NOUN 20	ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11	NOUN 10	ENTR
00012		ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL

to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR
i. VERB 16	NOUN 20	ENTR

56. Observe the DSKY indicates the following:

a. Row 1 indicates +00000 (±00100)
b. Row 2 indicates +00000 (±00100)
c. Row 3 indicates +00000 (±00100).

57. Enter VERB 36 into DSKY and press ENTR pushbutton.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. M INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position (Row 1)								

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. M

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (Row 3)								
	IG DSKY position (Row 2).								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx ** (xxx3x)				xxxxx ** (xxx3x)		

* To be used as required or desired
** MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616
REV M

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		
	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	| Step 38 - Step 48 |	VDC					0.25		
51	| Step 39 - Step 48 |	VDC					0.25		
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5		
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2				30.8		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0				+5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 1015J
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1, 2, 3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1, 2	-	EA	-
E	11-10-66	31902	3, 4, 5	-	EA	-
F	1-18-67	32667	6	1, 2	EA	-
G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1, 3, 4, 5	1, 2	EA	-
J	8-31-67	34456	-	1, 2	EA	-
K	3-28-68	35979	All	2, 3	EA	-
L	4-9-68	36043	1	-	EA	-
M	7-15-68	36548	All	3	EA	-
N	5-26-70	38138	1, 2, 7	-	EA	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to LGC test connector before proceeding with this JDC.

2. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

3. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

4. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

Program Aurora 85 (2021101-011). These differences are noted within the procedure.

5. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

NOTE: Step 7 applies only when Restart Monitor module (2898989) is installed.

7. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

IMU TIME DELAY

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. Observe:
0 ____ displayed in Row 1

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 ____ to 4 ____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing

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c. +09000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +09000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +09000 ENTR
h. VERB 16 NOUN 20 ENTR

NOTE: If LGC contains Aurora 85 test ropes, NO ATT lamp on DSKY will not light in step 17.

17. When the DSKY registers display:
Row 1 +09000 ±00500
Row 2 +09000 ±00500
Row 3 +09000 ±00500

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.
b. IRIG Temperature on CHANNEL 4-3.
c. IMU Heater Discrete on CHANNEL 5-15.
d. IMU Blower Discrete on CHANNEL 6-15.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers fromTPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed

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15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.

TURN-ON CAGE TEST AND CDU AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

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the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00500 ENTR
h. VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND

pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR
00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. VERB 16 NOUN 20 ENTR

56. Observe the DSKY indicates the following:

a. Row 1 indicates +00000 (±00100)
b. Row 2 indicates +00000 (±00100)
c. Row 3 indicates +00000 (±00100).

57. Enter VERB 36 into DSKY and press ENTR pushbutton.

NOTE: Step 58 applies only when Restart Monitor module (2898989) is installed.

58. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12616 JDC
REV. N
INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position (Row 1)								

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. N

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (Row 3)								
	IG DSKY position (Row 2)								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23.250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxox ** (xxx3x)				xxxox ** (xxx3x)		

* To be used as required or desired
** MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. N

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		
	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	| Step 38 - Step 48 |	VDC					0.25		
51	| Step 39 - Step 48 |	VDC					0.25		
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5		
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2				30.8		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0				+5.0		

* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	6-7-66	29401	All	All	MM	ACM
B	7-5-66	30045	1,2,3	-	MM	-
C	8-10-66	30550	All	All	EA	WS
D	10-13-66	31512	1,2	-	EA	-
E	11-10-66	31902	3,4,5	-	EA	-
F	1-18-67	32667	6	1,2	EA	-
G	3-30-67	33468	1	2	EA	-
H	8-10-67	34337	1,3,4,5	1,2	EA	-
J	8-31-67	34456	-	1,2	EA	-
K	3-28-68	35979	All	2,3	EA	-
L	4-9-68	36043	1	-	EA	-
M	7-15-68	36548	All	3	EA JF	-
N	5-26-70	38138	1, 2, 7	-	EA	-
P	2-8-71	38337	-	3	EA JF	-

REFERENCES PS-6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003099) or Restart Monitor module (2898989) is connected to LGC test connector before proceeding with this JDC.

2. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

3. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

4. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains

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Program Aurora 85 (2021101-011). These differences are noted within the procedure.

5. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Deleted.

2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

NOTE: Step 7 applies only when Restart Monitor module (2898989) is installed.

7. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

IMU TIME DELAY

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO
CLOCK FREQUENCY DIVIDER to 10^4
CLOCK SELECTOR to INT
INPUT SELECTOR to C SENSE
SENSE SELECTOR to FWD
FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. Observe:
0 ____ displayed in Row 1

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 ____ to 4 ____.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing

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c. +09000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +09000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +09000 ENTR
h. VERB 16 NOUN 20 ENTR

NOTE: If LGC contains Aurora 85 test ropes, NO ATT lamp on DSKY will not light in step 17.

17. When the DSKY registers display:
Row 1 +09000 ±00500
Row 2 +09000 ±00500
Row 3 +09000 ±00500

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3.
b. IRIG Temperature on CHANNEL 4-3.
c. IMU Heater Discrete on CHANNEL 5-15.
d. IMU Blower Discrete on CHANNEL 6-15.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers fromTPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed

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15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.

TURN-ON CAGE TEST AND CDU AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal	CROSSBAR CONTROL
a. Cos A_{OG} 1X	241
b. Cos A_{MG} 1X	242
c. Cos A_{IG} 1X	243
d. Sin A_{OG} 1X	142
e. Sin A_{MG} 1X	143
f. Sin A_{IG} 1X	144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust

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the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00500 ENTR
h. VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500
Row 2 +00500
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal	CROSSBAR CONTROL
a. Sin A_{OG} 1X	142
b. Sin A_{MG} 1X	143
c. Sin A_{IG} 1X	144

46. Release the IMU CAGE COMMAND

pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR
00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group
MS 99
Instrumentation Laboratory
75 Cambridge Parkway
Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. VERB 16 NOUN 20 ENTR

56. Observe the DSKY indicates the following:

a. Row 1 indicates +00000 (±00100)
b. Row 2 indicates +00000 (±00100)
c. Row 3 indicates +00000 (±00100).

57. Enter VERB 36 into DSKY and press ENTR pushbutton.

NOTE: Step 58 applies only when Restart Monitor module (2898989) is installed.

58. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

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EQUIPMENT TEST
DATA SHEET 1 OF 3

NO. 12616 JDC
REV. P
INITIAL TDRR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.50				28.50		
15	Elapsed time	sec	85				95		
18	Time	hr min							
28	PIPA Temperature Deviation (Standby)	VDC							
29	IRIG Temperature Deviation (Standby)	VDC							
31	Time	hr min							
32	PIPA torquing not present until after Display change								
35	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position (Row 1)								

* TO BE USED AS REQUIRED OR DESIRED

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. P

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
35 (cont)	MG DSKY position (Row 3)								
	IG DSKY position (Row 2)								
36	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
	PIPA Temperature Deviation (Operate 15 min)	VDC							
39	Time	min							
	IRIG Temperature Deviation (Operate 30 min)	VDC							
40	800 CPS/PS temperature	ohms	12210				18,370		
41	Temp Mon 1	ohms	11400				23,250		
42	PIPA Cal. Mod.	ohms	13650				23,250		
45	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
47	Row 1 display		xxxxx ** (xxx3x)				xxxxx ** (xxx3x)		

* To be used as required or desired
** MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. P

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0		
	IRIG Temperature Deviation (Operate stabilized	VDC	-1.25				+1.25		
49	| Step 28 - Step 48 |	VDC					0.50		
50	| Step 38 - Step 48 |	VDC					0.25		
51	| Step 39 - Step 48 |	VDC					0.35		
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5		
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2				30.8		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0				+5.0		

* TO BE USED AS REQUIRED OR DESIRED

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JOB OPERATE CONTROL TEST

SUBSYSTEM LEM G & N SYSTEM

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INITIAL TDRR _____ D.S. PGS 3
TDRR 27134 MAR 15 1960
ASSY.

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS-6015000

IMPORTANT INTERVAL Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

TOOLS AND MATERIAL Wheatstone bridge, 10 K ± 10% resistor

INITIALIZATION

1. Insure the OIA ON/ISS POWER DISABLED and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons on the Test Control panel are lighted.

2. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.

3. Insure that the PSA HTR PWR lamp on the Temperature Monitor panel is lighted.

4. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide DSKY illumination. The pushbuttons shall light.

5. Insure the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 (±0.25) vdc. Record indication.

IMU TIME DELAY

7. Set the Oscillograph Signal Selector panel to monitor the following signals:

a. Sin A_{OG} 1X CHANNEL 2 - 7
b. Sin A_{MG} 1X CHANNEL 3 - 7
c. Sin A_{IG} 1X CHANNEL 4 - 7

8. Insure that the 800 ~ 0 PH REFERENCE and CH3AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

9. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the Channel 2, 3, and 4 sensitivity on

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the Oscillograph Amplifier panel to 50 MV/MM.

10. Perform the following DSKY operations and record the displayed indications.

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR
c. 5____ displayed

11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

12. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 5____ to 7____.

14. Stop the Oscillograph and record the elapsed time from OG 1X resolver initial transient to EVENT MARKER indication.

15. Perform the following DSKY operations and record the displayed indications:

a. VERB 11 NOUN 10 ENTR
b. 00012 ENTR
c. 4____ displayed

16. Perform the following DSKY operations:

a. Enter VERB 41 NOUN 20 ENTR
b. Observe VERB 21 NOUN 22 Flashing
c. Enter +22500 ENTR
d. Observe VERB 22 NOUN 22 Flashing
e. Enter +22500
f. Observe VERB 23 NOUN 22 Flashing
g. Enter +22500 ENTR
h. Enter VERB 16 NOUN 20 ENTR

17. When the DSKY registers display:

Row 1 +225__
Row 2 +225__
Row 3 +225__

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals.

a. Accel Temperature on CHANNEL 3-3DC.
b. IRIG Temperature on CHANNEL 4-3DC.
c. IMU Heater Discrete on CHANNEL 5 AUX
d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC and the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-22 (lo) to CH 6, IN-DC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, 5, and 6 on the Oscillograph Amplifier.

DATE _____

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"
b. CHANNEL 4 "start of IRIG TEMP stability test"
c. CHANNEL 5 "start of IMU Heater Discrete"
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to 20 MV/MM on the Oscillograph Control for CHANNELS 3 and 4, and to 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precidence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00030 ENTR
c. 5____ displayed

28. Insure that at least 30 minutes have elapsed since the time recorded in step 18 and that the ISS has been in STANDBY during that period.

29. Insure that the Coolant and Power Console CKT 1 flow rate is 33 (±3) lbs/hour at 45 (±10) degrees fahrenheit.

30. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

31. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

32. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 31 and record the time.

33. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 5____ to 7____.

34. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 5____ to 7____.

35. After the DSKY display changes from 5____ to 7____, perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

36. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

DATE _____

1X SIN AND COS SIGNALS

37. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

	Signal	CROSSBAR CONTROL
a.	Cos A_{OG} 1X	241
b.	Cos A_{MG} 1X	242
c.	Cos A_{IG} 1X	243
d.	Sin A_{OG} 1X	142
e.	Sin A_{MG} 1X	143
f.	Sin A_{IG} 1X	144

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 32, press the EVENT MARKER on the Oscillograph Control panel and record the time.

39. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG Temperature voltage indicated on the DVM.

40. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA Temperature voltage indicated on the DVM.

41. Obtain PIPA STANDBY temperature and compare with PIPA Temp. measured in step 40. Calculate and record difference.

800 CPS P/S THERMISTOR

42. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

43. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

44. Measure and record PIPA Cal. Mod. thermistor resistance across TB5-16 and TB5-17 on TPA #2.

AUTO CAGE

45. Perform the following DSKY operations:

a. Enter VERB 41 NOUN 20 ENTER
b. Observe VERB 21 NOUN 21 Flashing
c. Enter +01000 ENTER
d. Observe VERB 22 NOUN 22 Flashing
e. Enter + 01000 ENTER
f. Observe VERB 23 NOUN 22 Flashing
g. Enter + 01000 ENTER
h. Enter VERB 16 NOUN 20 ENTER

46. When the DSKY registers display

Row 1 +01000
Row 2 +01000
Row 3 +01000

Press the IMU CAGE COMMAND pushbutton on the Test Control panel.

DATE _____

47. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

	Signal	CROSSBAR CONTROL
a.	Sin A_{OG} 1X	142
b.	Sin A_{MG} 1X	143
c.	Sin A_{IG} 1X	144

48. Press the IMU CAGE COMMAND push-button on the Test Control Panel and perform the following DSKY operations:

VERB 11	NOUN 10	ENTR
+00012		ENTR

49. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

50. One hour after performing step 38, press the EVENT MARKER on the Oscillograph Control Panel, record the time, and stop the Oscillograph.

51. Record the following deviations:

a. The maximum and minimum voltage deviation on CHANNEL 3 between the voltages marked in step 38 to step 51.

b. The maximum and minimum voltage deviation on CHANNEL 4 between the voltage marked in step 38 to step 51.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 6.

NORMALIZATION

54. Perform the following DSKY operations:

a.	Enter	VERB 41 NOUN 20	ENTER
b.	Observe	VERB 21 NOUN 22	Flashing
c.	Enter	+ 00000	ENTER
d.	Observe	VERB 22 NOUN 22	Flashing
e.	Enter	+ 00000	
f.	Observe	VERB 23 NOUN 22	Flashing
g.	Enter	+ 00000	
h.	Enter	VERB 16 NOUN 20	ENTER

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12616 REV. - INITIAL TDRR

JOB OPERATE CONTROL TEST TDRR 27134 MAR 15 1966

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____
NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
6	DVM voltage	volts	27.75				28.25		
10	Row 1		5___				5___		
14	Elapsed time	sec	85				95		
15	Row 1		4___				4___		
18	Time	hr min							
28	Elapsed time	min	30						
32	Time	hr min							
33	PIPA torquing not present until after Display change								
36	OG Gimbal position								
	MG Gimbal position								
	IG Gimbal position								
	OG DSKY position								

* TO BE USED AS REQUIRED OR DESIRED

DATE _____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12616 REV. -

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
36 (cont)	MG DSKY position								
	IG DSKY position								
37	Cos A_{OG} 1X	vrms	23.4				28.6		
	Cos A_{MG} 1X	vrms	23.4				28.6		
	Cos A_{IG} 1X	vrms	23.4				28.6		
	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
38	Time	min							
39	IRIG temperature	volts	-1.0				+1.0		
40	PIPA temperature	volts	-1.0				+1.0		
41	PIPA STANDBY temperature	volts							
	Step 40 - step 41 = | |	volts					1.0		
42	800 CPS/PS temperature	ohms	12320				27,700		
43	Temp Mon 1	ohms	11220				27,700		
44	PIPA Cal. Mod.	ohms	14120				27,700		

* TO BE USED AS REQUIRED OR DESIRED

DATE _____

APOLLO G & N
FQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12616 REV. -

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
47	Sin A_{OG} 1X	vrms	0.00				0.50		
	Sin A_{MG} 1X	vrms	0.00				0.50		
	Sin A_{IG} 1X	vrms	0.00				0.50		
49	Row 1 display		xxxox				xxxox		
50	Time	hr min							
51	Voltage Deviation Step 38 - Step 51 = | | CHANNEL 3	vdc					0.200		
	Voltage Deviation Step 38 - Step 51 = | | CHANNEL 4	vdc					0.200		
52	Maximum CHANNEL 5 voltage	vdc	27				29		
	Minimum CHANNEL 5 voltage	vdc	0.00						
53	CHANNEL 6 voltage	vdc					29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE _____

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character displ[illegible]ration. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	5-25-66	29177	2-5	All	MM	ACM	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	Noun 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY
} on currently for 5 seconds

r. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. COMP ACTY
l. VERB-NOUN Flashing
m. Plus 88888 in ROW 1, ROW 2 and ROW 3
} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe VERB 24	NOUN 01	Flashing
c.	01700		ENTR
d.	Observe VERB 21	NOUN 01	Flashing
e.	+12345		ENTR
f.	Observe VERB 22	NOUN 01	Flashing
g.	-67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	00015		ENTR
c.	VERB 21	NOUN 02	ENTR
d.	Observe VERB 21	NOUN 02	Flashing
e.	01600		ENTR
f.	Observe VERB 21	NOUN 02	Flashing
g.	33777		ENTR
h.	VERB 25	NOUN 26	ENTR
i.	Observe VERB 21	NOUN 26	Flashing
j.	04000		ENTR
k.	Observe VERB 22	NOUN 26	Flashing
l.	01600		ENTR
m.	Observe VERB 23	NOUN 26	Flashing

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n.	00003		ENTR
o.	VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY, the CGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR
i.	Observe VERB 21	NOUN 26	Flashing
j.	00001		ENTR
k.	Observe VERB 22	NOUN 26	Flashing
l.	01600		ENTR
m.	Observe VERB 23	NOUN 26	Flashing
n.	00003		ENTR
o.	VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY, the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a.	VERB 21	NOUN 02	ENTR
b.	Observe VERB 21	NOUN 02	Flashing
c.	01600		ENTR
d.	Observe VERB 21	NOUN 02	Flashing
e.	01600		ENTR
f.	VERB 25	NOUN 26	ENTR
g.	Observe VERB 21	NOUN 26	Flashing
h.	04000		ENTR
i.	Observe VERB 22	NOUN 26	Flashing
j.	01600		ENTR
k.	Observe VERB 23	NOUN 26	Flashing
l.	00003		ENTR
m.	VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, the CGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel are

DATE 15 MAR 66

lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	Observe VERB 24	NOUN 01	Flashing
c.	01600		ENTR
d.	Observe VERB 21	NOUN 01	Flashing
e.	30001		ENTR
f.	Observe VERB 22	NOUN 01	Flashing
g.	01600		ENTR
h.	VERB 25	NOUN 26	ENTR
i.	Observe VERB 21	NOUN 26	Flashing
j.	03400		ENTR
k.	Observe VERB 22	NOUN 26	Flashing
l.	01600		ENTR
m.	Observe VERB 23	NOUN 26	Flashing
n.	00003		ENTR
o.	VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY, the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a.	VERB 21	NOUN 27	ENTR
b.	Observe VERB 21	NOUN 27	Flashing
c.	77767		ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing

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c. 00004 ENTR

d. Observe
VERB 16 NOUN 20 Displayed

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications. (During the 12 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. A INITIAL TDRR

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ___	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____
NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 R2 _____ . _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		25.0		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	33.5		33.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. A

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

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A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	Noun 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY

} on currently for 5 seconds

r. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. COMP ACTY
l. VERB-NOUN Flashing
m. Plus 88888 in ROW 1, ROW 2 and ROW 3

} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 02	ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. Observe VERB 21	NOUN 02	Flashing
g. 33777		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 04000		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing

n. 00003		ENTR
o. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. Observe VERB 21	NOUN 27	Flashing
c. 77767		ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing

c. 00004 ENTR

d. Observe
VERB 16 NOUN 20 Displayed

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications. (During the 12 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. B INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE ____
NAME _____ SER. NO. ____ CAL DATE ____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 R2 _____ . _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		25.0		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	33.5		33.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

FORM 0116
Chg. 1-13-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. B

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	Noun 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY

} on currently for 5 seconds

r. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press ENTR	

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 02	ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. Observe VERB 21	NOUN 02	Flashing
g. 33777		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 04000		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing

n. 00003		ENTR
o. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. Observe VERB 21	NOUN 27	Flashing
c. 77767		ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing

c. 00004 ENTR

d. Observe
VERB 16 NOUN 20 Displayed

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications. (During the 12 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. C INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. ____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 R2 _____ . _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV C

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	Noun 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY
} on currently for 5 seconds

r. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3
} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 02	ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. Observe VERB 21	NOUN 02	Flashing
g. 33777		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 04000		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing

n. 00003		ENTR
o. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. Observe VERB 21	NOUN 27	Flashing
c. 77767		ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing

c. 00004 ENTR

d. Observe
VERB 16 NOUN 20 Displayed

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications. (During the 12 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. D INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 R2 _____ . _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. D

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	5-25-66	29177	2-5	All	MMK	ACM	
B	7-21-66	30272	3, 4	-	EA	MB	
C	8-4-66	30519	2, 5	1	EA	-	IMPORTANT See below.
D	10-20-66	31617	1	-	EA	-	
E	2-2-67	32885	1, 5	-	EA	-	
							INTERVAL
							TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY

} on currently for 5 seconds

r. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press ENTR	

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 02	ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. Observe VERB 21	NOUN 02	Flashing
g. 33777		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 04000		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing

n. 00003		ENTR
o. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. Observe VERB 21	NOUN 27	Flashing
c. 77767		ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY
} on currently for 5 seconds

r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3
} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe VERB 22 NOUN 01, Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 02 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. Observe VERB 21 NOUN 02 Flashing
g. 33777 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 04000 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing

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n. 00003 ENTR
o. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

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lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 03400 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe VERB 21 NOUN 27 Flashing
c. 77767 ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe VERB 21 NOUN 01 Flashing

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c. 00004 ENTR

d. Observe
VERB 16 NOUN 20 Displayed

e. VERB 34 ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. E INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 _____ R2 _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. E

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

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c. 00004 ENTR

d. Observe
VERB 16 NOUN 20 Displayed

e. VERB 34 ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. E INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 _____ R2 _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

FORM 00196
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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. E

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

FORM 00196
Chg. 7-23-65

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	NOUN 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

(j–m: on concurrently for 5 seconds)

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY

(o–q: on currently for 5 seconds)

r. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

(a–l: on concurrently for 5 seconds)

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57		ENTR
b. 00015		ENTR
c. VERB 21	NOUN 02	ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. Observe VERB 21	NOUN 02	Flashing
g. 33777		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 04000		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. Observe VERB 21	NOUN 27	Flashing
c. 77767		ENTR

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57		ENTR
b. Observe VERB 21	NOUN 01	Flashing
c. 00004		ENTR
d. Observe VERB 16	NOUN 20	Displayed
e. VERB 34		ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. F INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec^2	975.0	R1 R2 _____ . _____	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. F

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-

REFERENCES

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3 } on concurrently for 5 seconds
l. VERB-NOUN Flashing
m. COMP ACTY
o. Plus signs in ROW 1, ROW 2, ROW 3 } on currently for 5 seconds
p. VERB-NOUN Flashing
q. COMP ACTY
r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

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6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 21 NOUN 02 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. Observe VERB 21 NOUN 02 Flashing
g. 33777 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 04000 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

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13. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 03400 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DATE 15 MAR 66

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a.	VERB 21	NOUN 27	ENTR
b.	Observe VERB 21	NOUN 27	Flashing
c.	77767		ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing
c.	00004		ENTR
d.	Observe VERB 16	NOUN 20	Displayed
e.	VERB 34		ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV G INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
23	LGC self check failures						
26	gravity	cm/sec^2	975.0	R1 R2	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec^2	975.0		985.9		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV G

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	5-25-66	29177	2-5	All	MM	ACM	
B	7-21-66	30272	3, 4	-	EA	MB	
C	8-4-66	30519	2, 5	1	EA	-	IMPORTANT See below.
D	10-20-66	31617	1	-	EA	-	
E	2-2-67	32885	1, 5	-	EA	-	
F	7-27-67	34232	1	-	EA	-	INTERVAL
G	8-31-67	34457	3,4,5	1	EA	-	
H	11-30-67	35185	1,3,5	1	EA	-	TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/ LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3 } on concurrently for 5 seconds
l. VERB-NOUN Flashing
m. COMP ACTY
o. Plus signs in ROW 1, ROW 2, ROW 3 } on currently for 5 seconds
p. VERB-NOUN Flashing
q. COMP ACTY
r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

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6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00015 ENTR
c. VERB 27 NOUN 01 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

DATE 15 MAR 66

13. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 03400 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DATE 15 MAR 66

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a.	VERB 21	NOUN 27	ENTR
b.	Observe VERB 21	NOUN 27	Flashing
c.	77767		ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing
c.	00004		ENTR
d.	Observe VERB 16	NOUN 20	Displayed
e.	VERB 34		ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 3. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12617 JDC
REV H
INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
23	LGC self check failures						
26	gravity	cm/sec^2	975.0	R1 R2	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(23)	LGC self check failures						
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617
REV H

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(23)	LGC self check failures						
36(26)	gravity	cm/sec^2	975.0		985.9		
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DATE 15 MAR 66

FORM 00147
Chg. 8-29-66

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	5-25-66	29177	2-5	All	MMC	ACM	
B	7-21-66	30272	3, 4	-	EA	MB	
C	8-4-66	30519	2, 5	1	EA	-	IMPORTANT See below.
D	10-20-66	31617	1	-	EA	-	
E	2-2-67	32885	1, 5	-	EA	-	
F	7-27-67	34232	1	-	EA	-	INTERVAL
G	8-31-67	34457	3,4,5	1	EA	-	
H	11-30-67	35185	1,3,5	1	EA	-	TOOLS AND MATERIAL
J	1-11-68	35386	3	All	EA	-	

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/ LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3 } on concurrently for 5 seconds
l. VERB-NOUN Flashing
m. COMP ACTY
o. Plus signs in ROW 1, ROW 2, ROW 3 } on currently for 5 seconds
p. VERB-NOUN Flashing
q. COMP ACTY
r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3
} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

DATE 15 MAR 66

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 27 NOUN 01 ENTR
c. Observe VERB 27 NOUN 01 Flashing
d. 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

DATE 15 MAR 66

13. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 03400 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DATE 15 MAR 66

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe VERB 16 NOUN 20 Displayed
e. VERB 34 _____ ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0, -0.25) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12617 JDC
REV J
INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME / AFFILIATION APPROVED BY _____ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
23	LGC self check failures						
26	gravity	cm/sec^2	975.0	R1 R2	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.25		24.5		
32(23)	LGC self check failures						
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617
REV J

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	IMU 28 vdc Bus	vdc	33.5		33.75		
36(23)	LGC self check failures						
36(26)	gravity	cm/sec^2	975.0		985.9		
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table1		

COMMENTS

DATE 15 MAR 66

FORM 00147
Chg. 8-29-66

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	5-25-66	29177	2-5	All	MM	ACM	
B	7-21-66	30272	3, 4	-	EA	MB	
C	8-4-66	30519	2, 5	1	EA	-	IMPORTANT See below.
D	10-20-66	31617	1	-	EA	-	
E	2-2-67	32885	1, 5	-	EA	-	
F	7-27-67	34232	1	-	EA	-	INTERVAL
G	8-31-67	34457	3,4,5	1	EA	-	
H	11-30-67	35185	1,3,5	1	EA	-	TOOLS AND MATERIAL
J	1-11-68	35386	3	All	EA	-	
K	4-9-68	36044	All	All	EA	-	

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/ LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

DSKY CHECK

2. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 27	ENTR
c. 00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

(j–m: on concurrently for 5 seconds)

n. Plus signs in ROW 1, ROW 2, ROW 3
o. VERB-NOUN Flashing
p. COMP ACTY

(n–p: on currently for 5 seconds)

q. COMP ACTY — on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

(a–l: on concurrently for 5 seconds)

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -67890	Do NOT press ENTR	

DATE 15 MAR 66

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 36		ENTR
b. VERB 27	NOUN 01	ENTR
c. Observe VERB 27	NOUN 01	Flashing
d. 70000		ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

DATE 15 MAR 66

13. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations;

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RSET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DATE 15 MAR 66

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57 ENTR
b. Observe VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

PIPA AND IRIG TEST (Low Voltage)

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

PIPA AND IRIG TEST (High Voltage)

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12617 JDC
REV K
INITIAL TORR 2714

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME / AFFILIATION APPROVED BY NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
23	LGC self check failures						
26	gravity	cm/sec²	975.0	R1 R2 ----------	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.50		24.75		
32(23)	LGC self check failures						
32(26)	gravity	cm/sec²	975.9		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617
REV K

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.	IMU 28 vdc Bus	vdc	33.25		33.50		
36(23)	LGC self check failures						
36(26)	gravity	cm/sec²	975.0		985.9		
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table1		

COMMENTS

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	5-25-66	29177	2-5	All	MM	ACM	
B	7-21-66	30272	3, 4	-	EA	MB	
C	8-4-66	30519	2, 5	1	EA	-	IMPORTANT See below.
D	10-20-66	31617	1	-	EA	-	
E	2-2-67	32885	1, 5	-	EA	-	
F	7-27-67	34232	1	-	EA	-	INTERVAL
G	8-31-67	34457	3,4,5	1	EA	-	
H	11-30-67	35185	1,3,5	1	EA	-	TOOLS AND MATERIAL
J	1-11-68	35383	3	All	EA	-	
K	4-9-68	36044	All	All	EA	-	
L	7-25-68	36585	2, 3	-	EA	-	

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/ LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

DSKY CHECK

2. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY

} on concurrently for 5 seconds

n. Plus signs in ROW 1, ROW 2, ROW 3
o. VERB-NOUN Flashing
p. COMP ACTY

} on currently for 5 seconds

q. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in ROW 1, ROW 2 and ROW 3

} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2, ROW 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

DATE 15 MAR 66

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. Observe: VERB 21 NOUN 01 Flashing
d. 01365 ENTR
e. 00000 ENTR
f. VERB 27 NOUN 01 ENTR
g. Observe: VERB 27 NOUN 01 Flashing
h. 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 00001 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

DATE 15 MAR 66

13. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21 NOUN 02 ENTR
b. Observe VERB 21 NOUN 02 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 02 Flashing
e. 01600 ENTR
f. VERB 25 NOUN 26 ENTR
g. Observe VERB 21 NOUN 26 Flashing
h. 04000 ENTR
i. Observe VERB 22 NOUN 26 Flashing
j. 01600 ENTR
k. Observe VERB 23 NOUN 26 Flashing
l. 00003 ENTR
m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe VERB 24 NOUN 01 Flashing
c. 01600 ENTR
d. Observe VERB 21 NOUN 01 Flashing
e. 30001 ENTR
f. Observe VERB 22 NOUN 01 Flashing
g. 01600 ENTR
h. VERB 25 NOUN 26 ENTR
i. Observe VERB 21 NOUN 26 Flashing
j. 03400 ENTR
k. Observe VERB 22 NOUN 26 Flashing
l. 01600 ENTR
m. Observe VERB 23 NOUN 26 Flashing
n. 00003 ENTR
o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RSET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a.	VERB 21	NOUN 27	ENTR
b.	Observe VERB 21	NOUN 27	Flashing
c.	77767		ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a.	VERB 57		ENTR
b.	Observe VERB 21	NOUN 01	Flashing
c.	00004		ENTR
d.	Observe VERB 16	NOUN 20	Displayed
e.	VERB 34		ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

PIPA AND IRIG TEST (Low Voltage)

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

PIPA AND IRIG TEST (High Voltage)

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

NO. 12617 JDC
REV L
INITIAL TDRR 271:4

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
23	LGC self check failures						
26	gravity	cm/sec^2	975.0	R1 R2	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.50		24.75		
32(23)	LGC self check failures						
32(26)	gravity	cm/sec^2	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617
REV L

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	IMU 28 vdc Bus	vdc	33.25		33.50		
36(23)	LGC self check failures						
36(26)	gravity	cm/sec^2	975.0		985.9		
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table1		

COMMENTS

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
J	1-11-68	35386	3	All	EA	-
K	4-9-68	36044	All	All	EA	-
L	7-25-68	36585	2, 3	-	EA	-
M	10-24-68	36957	All	All	EA	

REFERENCES
PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

panel lighted.

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.

2. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHTWATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N 2014042-071 only
ALARMS #16 - E-MEMORY PARITY FAIL

DSKY CHECK

2. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY

} on concurrently for approx. 5 seconds

n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY

} on concurrently for approx. 5 seconds

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q. COMP ACTY on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1, Row 2, and Row 3

} on concurrently for approx. 5 seconds

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe: VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe: VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe: VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

DATE 15 MAR 66

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12617 CTS UPLINK Tape, P/N 2901655-001

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
c. Logic Drawer No. 2 - Set AGREEMENT B digitswitches to X12X3672. Set AGREEMENT B switch to STOP.
d. RDC Interface panel - Press to light CH33-10 pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

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MANUAL LOAD PROCEDURES

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. Observe:		
VERB 21	NOUN 01	Flashing
d. 01365		ENTR
e. 00000		ENTR
f. VERB 27	NOUN 01	ENTR
g. Observe:		
VERB 27	NOUN 01	Flashing
h. 70000		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

and Monitor panel and RSET pushbutton on DSKY.

f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel.

8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.

10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.

11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

12. Enter VERB 36 and press ENTR pushbutton on DSKY.

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

RUPT LOCK

13. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing

RUPT LOCK

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

n. 00003	ENTR
o. VERB 31	ENTR

CTS UPLINK TAPE LOAD PROCEDURES

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.

16. Press EXECUTE pushbutton on Programmer and Monitor panel.

17. Perform following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. 01000		ENTR
c. VERB 30		ENTR

17. Press EXECUTE pushbutton on Programmer and Monitor panel.

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.

20. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

TC TRAP TEST

21. Perform following DKSY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe:		
VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe:		
VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe:		
VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe:		
VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

TC TRAP TEST

21. Press EXECUTE pushbutton on Programmer and Monitor panel.

21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.

24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

MANUAL LOAD PROCEDURES

28. Enter VERB 36 and press ENTR pushbutton on DSKY.

T5/T6 RUPT TEST

29. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01300		ENTR
c. 31304		ENTR
d. NOUN 15		ENTR
e. 00006		ENTR ENTR
f. 05013		ENTR ENTR
g. 04511		ENTR ENTR
h. 40000		ENTR ENTR
i. 31312		ENTR ENTR
j. 54030		ENTR ENTR
k. 31313		ENTR ENTR
l. 54345		ENTR ENTR
m. 04353		ENTR ENTR
n. 36027		ENTR ENTR
o. 01314		ENTR ENTR
p. 04572		ENTR ENTR
q. 00011		ENTR ENTR
r. 01300		ENTR
s. VERB 25	NOUN 26	ENTR
t. 01000		ENTR
u. 01305		ENTR
v. 00002		ENTR
w. VERB 21	NOUN 01	ENTR
x. 00031		ENTR
y. 37777		ENTR
z. VERB 11	NOUN 01	ENTR
aa. 00031		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

and Monitor panel. All CTS alarm indications shall go out.

28. Press EXECUTE pushbutton on Programmer and Monitor panel.

T5/T6 RUPT TEST

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

32. Enter VERB 30 and press ENTR pushbutton on DSKY.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.

34. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. 00031		ENTR
d. 40000		ENTR
e. VERB 11	NOUN 01	ENTR
f. 00031		ENTR

35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

36. Enter VERB 30 and press ENTR pushbutton on DSKY.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.

CTS UPLINK TAPE LOAD PROCEDURES

30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Verify that RG display does not indicate 34055.

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.

34. Press EXECUTE pushbutton on Programmer and Monitor panel.

35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.

36. Press EXECUTE pushbutton on Programmer and Monitor panel.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

MANUAL LOAD PROCEDURES

38. Enter VERB 36 and press ENTR pushbutton on DSKY.

RADAR RUPT TEST

39. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR

40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

41. Enter VERB 30 and press ENTR pushbutton on DSKY.

42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.

44. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR

45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

CTS UPLINK TAPE LOAD PROCEDURES

38. Press EXECUTE pushbutton on Programmer and Monitor panel.

RADAR RUPT TEST

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
61. Enter VERB 30 and press ENTR pushbutton on DSKY.	61. Press EXECUTE pushbutton on Programmer and Monitor panel.
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
65. Enter VERB 30 and press ENTR pushbutton on DSKY.	65. Press EXECUTE pushbutton on Programmer and Monitor panel.
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
69. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	69. Press EXECUTE pushbutton on Programmer and Monitor panel.
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Porgrammer and Monitor panel indicates zero.	89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
93. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.	94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.	
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.	
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.	
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.	
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.	
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.	
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.	
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.	
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
136. Enter VERB 36 and press ENTR pushbutton on DSKY.	136. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
LGC SELF CHECK	LGC SELF CHECK
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767	137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.	NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
PIPA AND IRIG TEST (Nominal Voltage)	PIPA AND IRIG TEST (Nominal Voltage)
138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.	145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (Low Voltage)	PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.	149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c 77767 ENTR	150. Press EXECUTE pushbutton on Programmer and Monitor panel 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.	153. Press EXECUTE pushbutton on Programmer and Monitor panel.
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (High Voltage)	PIPA AND IRIG TEST (High Voltage)
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.	

MANUAL LOAD PROCEDURES

157. Enter VERB 36 and press ENTR pushbutton on DSKY.

158. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe:
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.

159. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe:
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

157. Press EXECUTE pushbutton on Programmer and Monitor panel

158. Press EXECUTE pushbutton on Programmer and Monitor panel.

158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displaed on DSKY. If no failure occurs, write "none" on data sheet.

159. Press EXECUTE pushbutton on Programmer and Monitor panel.

159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.

161. Enter VERB 33 and press ENTR pushbutton on DSKY.

161. Press EXECUTE pushbutton on Programmer and Monitor panel.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Enter VERB 36 and press ENTR pushbutton on DSKY.

163. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

CTS UPLINK TAPE LOAD PROCEDURES

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digitswitches to XXXXXXXX.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. M INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE
NAME _____ SER. NO. ____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec²	975.0	R1 R2 -----.-----	985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec²	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. M

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50		
158	LGC self check failures						
160	gravity	cm/sec²	975.0		985.9		
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

Horizontal Earth Rate Tolerances

Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS;

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
J	1-11-68	35386	3	All	EA	-
K	4-9-68	36044	All	All	EA	-
L	7-25-68	36585	2, 3	-	EA	-
M	10-24-68	36957	All	All	EA	-
N	2-24-69	37364	19	-	EA	-

REFERENCES
PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

panel lighted.

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.

2. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHTWATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N 2014042-071 only
ALARMS #18 - E-MEMORY PARITY FAIL

DSKY CHECK

2. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3 } on concurrently for approx. 5 seconds
l. VERB-NOUN Flashing
m. COMP ACTY
n. Plus signs in Row 1, Row 2, and Row 3 } on concurrently for approx. 5 seconds
o. VERB-NOUN Flashing
p. COMP ACTY

q. COMP ACTY } on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1, Row 2, and Row 3

} on concurrently for approx. 5 seconds

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe: VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe: VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe: VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12617 CTS UPLINK Tape, P/N 2901655-001

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
c. Logic Drawer No. 2 - Set AGREEMENT B digitswitches to X12X3672. Set AGREEMENT B switch to STOP.
d. RDC Interface panel - Press to light CH33-10 pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	and Monitor panel and RSET pushbutton on DSKY.
	f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.
	g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.
ALARM AND INTERRUPT TEST PARITY FAIL TEST	ALARM AND INTERRUPT TEST PARITY FAIL TEST
8. Perform following DSKY operations:	8. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 21 NOUN 01 ENTR	8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.
c. Observe: VERB 21 NOUN 01 Flashing	
d. 01365 ENTR	
e. 00000 ENTR	
f. VERB 27 NOUN 01 ENTR	
g. Observe: VERB 27 NOUN 01 Flashing	
h. 70000 ENTR	

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.
	10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.
	11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
12. Enter VERB 36 and press ENTR pushbutton on DSKY.	12. Press EXECUTE pushbutton on Programmer and Monitor panel.
RUPT LOCK	RUPT LOCK
13. Perform following DSKY operations:	13. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 24 NOUN 01 Flashing	13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 01 Flashing	13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 30001 ENTR	13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe: VERB 22 NOUN 01 Flashing	13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
g. 01600 ENTR	
h. VERB 25 NOUN 26 ENTR	
i. Observe: VERB 21 NOUN 26 Flashing	
j. 00001 ENTR	
k. Observe: VERB 22 NOUN 26 Flashing	
l. 01600 ENTR	
m. Observe: VERB 23 NOUN 26 Flashing	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
n. 00003 ENTR	
o. VERB 31 ENTR	

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.	16. Press EXECUTE pushbutton on Programmer and Monitor panel.
17. Perform following DSKY operations:	17. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 27 ENTR	
b. 01000 ENTR	
c. VERB 30 ENTR	

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.	20. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
TC TRAP TEST	TC TRAP TEST
21. Perform following DKSY operations:	21. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 02 ENTR	21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 21 NOUN 02 Flashing	21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 02 Flashing	21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 01600 ENTR	21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. VERB 25 NOUN 26 ENTR	
g. Observe: VERB 21 NOUN 26 Flashing	
h. 04000 ENTR	
i. Observe: VERB 22 NOUN 26 Flashing	
j. 01600 ENTR	
k. Observe: VERB 23 NOUN 26 Flashing	
l. 00003 ENTR	
m. VERB 30 ENTR	

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.	24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
NIGHT WATCHMAN TEST	NIGHT WATCHMAN TEST
25. Perform following DSKY operations:	25. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 24 NOUN 01 Flashing	25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 01 Flashing	25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 30001 ENTR	25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe: VERB 22 NOUN 01 Flashing	25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
g. 01600 ENTR	
h. VERB 25 NOUN 26 ENTR	
i. Observe: VERB 21 NOUN 26 Flashing	
j. 03400 ENTR	
k. Observe: VERB 22 NOUN 26 Flashing	
l. 01600 ENTR	
m. Observe: VERB 23 NOUN 26 Flashing	
n. 00003 ENTR	
o. VERB 30 ENTR	

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
and Monitor panel. All CTS alarm indications shall go out.	
28. Enter VERB 36 and press ENTR pushbutton on DSKY.	28. Press EXECUTE pushbutton on Programmer and Monitor panel.
T5/T6 RUPT TEST	T5/T6 RUPT TEST
29. Perform following DSKY operations:	29. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 01 ENTR	
b. 01300 ENTR	
c. 31304 ENTR	
d. NOUN 15 ENTR	
e. 00006 ENTR ENTR	
f. 05013 ENTR ENTR	
g. 04511 ENTR ENTR	
h. 40000 ENTR ENTR	
i. 31312 ENTR ENTR	
j. 54030 ENTR ENTR	
k. 31313 ENTR ENTR	
l. 54345 ENTR ENTR	
m. 04353 ENTR ENTR	
n. 36027 ENTR ENTR	
o. 01314 ENTR ENTR	
p. 04572 ENTR ENTR	
q. 00011 ENTR ENTR	
r. 01300 ENTR	
s. VERB 25 NOUN 26 ENTR	
t. 01000 ENTR	
u. 01305 ENTR	
v. 00002 ENTR	
w. VERB 21 NOUN 01 ENTR	
x. 00031 ENTR	
y. 37777 ENTR	
z. VERB 11 NOUN 01 ENTR	
aa. 00031 ENTR	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.
31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	31. Verify that RG display does not indicate 34055.
32. Enter VERB 30 and press ENTR pushbutton on DSKY.	32. Press EXECUTE pushbutton on Programmer and Monitor panel.
33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.	33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.
34. Perform following DSKY operations:	34. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	
b. VERB 21 NOUN 01 ENTR	
c. 00031 ENTR	
d. 40000 ENTR	
e. VERB 11 NOUN 01 ENTR	
f. 00031 ENTR	
35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.
36. Enter VERB 30 and press ENTR pushbutton on DSKY.	36. Press EXECUTE pushbutton on Programmer and Monitor panel.
37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.	37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
38. Enter VERB 36 and press ENTR pushbutton on DSKY.	38. Press EXECUTE pushbutton on Programmer and Monitor panel.
RADAR RUPT TEST	RADAR RUPT TEST
39. Perform following DSKY operations:	39. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	
b. 01303 ENTR	
c. 04353 ENTR	
d. 00010 ENTR	
e. VERB 22 NOUN 26 ENTR	
f. 01300 ENTR	
40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
41. Enter VERB 30 and press ENTR pushbutton on DSKY.	41. Press EXECUTE pushbutton on Programmer and Monitor panel.
42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.	42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.
T10 RUPT TEST	T10 RUPT TEST
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.	
44. Perform following DSKY operations:	44. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 01 ENTR	
b. 01304 ENTR	
c. 04000 ENTR	
d. VERB 30 ENTR	
45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
61. Enter VERB 30 and press ENTR pushbutton on DSKY.	61. Press EXECUTE pushbutton on Programmer and Monitor panel.
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
65. Enter VERB 30 and press ENTR pushbutton on DSKY.	65. Press EXECUTE pushbutton on Programmer and Monitor panel.
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
69. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	69. Press EXECUTE pushbutton on Programmer and Monitor panel.
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Porgrammer and Monitor panel indicates zero.	89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
93. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR; b. 01304 ENTR; c. 20000 ENTR; d. VERB 11 NOUN 10 ENTR; e. 00032 ENTR	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.	94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.	
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.	
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.	
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.	
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.	
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.	
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.	
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.	
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
136. Enter VERB 36 and press ENTR pushbutton on DSKY.	136. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
LGC SELF CHECK	LGC SELF CHECK
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767	137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.	NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
PIPA AND IRIG TEST (Nominal Voltage)	PIPA AND IRIG TEST (Nominal Voltage)
138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.	145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (Low Voltage)	PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.	149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR	150. Press EXECUTE pushbutton on Programmer and Monitor panel 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.	153. Press EXECUTE pushbutton on Programmer and Monitor panel.
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (High Voltage)	PIPA AND IRIG TEST (High Voltage)
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
157. Enter VERB 36 and press ENTR pushbutton on DSKY.	157. Press EXECUTE pushbutton on Programmer and Monitor panel
158. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	158. Press EXECUTE pushbutton on Programmer and Monitor panel. 158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displaed on DSKY. If no failure occurs, write "none" on data sheet.
159. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	159. Press EXECUTE pushbutton on Programmer and Monitor panel. 159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel 159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
161. Enter VERB 33 and press ENTR pushbutton on DSKY.	161. Press EXECUTE pushbutton on Programmer and Monitor panel.
162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
163. Enter VERB 36 and press ENTR pushbutton on DSKY.	163. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
	165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.
	166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.
	167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.
	168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digitswitches to XXXXXXXX.
	169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.
	170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. N INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____
NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec^2	975.0	R1 R2 - - - - - . - - . - - -	985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec^2	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. N

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50		
158	LGC self check failures						
160	gravity	cm/sec^2	975.0		985.9		
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS;

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
J	1-11-68	35386	3	All	EA	-
K	4-9-68	36044	All	All	EA	-
L	7-25-68	36585	2,3	-	EA	-
M	10-24-68	36957	All	All	EA	
N	2-24-69	37364	19	-	EA	-
P	3-27-69	37451	4, 10	-	EA	-

REFERENCES
PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

panel lighted.

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.

2. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHTWATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N
ALARMS #18 - E-MEMORY PARITY FAIL 2014042-071 only

DSKY CHECK

2. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:
a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for approx. 5 seconds
n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY
} on concurrently for approx. 5 seconds

q. COMP ACTY on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:
a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1, Row 2, and Row 3
} on concurrently for approx. 5 seconds

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe: VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe: VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe: VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12617 CTS UPLINK Tape, P/N 2901655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
c. Logic Drawer No. 2 - Set AGREEMENT B digitswitches to X12X3672. Set AGREEMENT B switch to STOP.
d. RDC Interface panel - Press to light CH33-10 pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	and Monitor panel and RSET pushbutton on DSKY.
	f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.
	g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.
ALARM AND INTERRUPT TEST PARITY FAIL TEST	ALARM AND INTERRUPT TEST PARITY FAIL TEST
8. Perform following DSKY operations:	8. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 21 NOUN 01 ENTR	8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.
c. Observe: VERB 21 NOUN 01 Flashing	
d. 01365 ENTR	
e. 00000 ENTR	
f. VERB 27 NOUN 01 ENTR	
g. Observe: VERB 27 NOUN 01 Flashing	
h. 70000 ENTR	

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.
	10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.
	11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
12. Enter VERB 36 and press ENTR pushbutton on DSKY.	12. Press EXECUTE pushbutton on Programmer and Monitor panel.
RUPT LOCK	RUPT LOCK
13. Perform following DSKY operations:	13. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 24 NOUN 01 Flashing	13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 01 Flashing	13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 30001 ENTR	13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe: VERB 22 NOUN 01 Flashing	13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
g. 01600 ENTR	
h. VERB 25 NOUN 26 ENTR	
i. Observe: VERB 21 NOUN 26 Flashing	
j. 00001 ENTR	
k. Observe: VERB 22 NOUN 26 Flashing	
l. 01600 ENTR	
m. Observe: VERB 23 NOUN 26 Flashing	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
n. 00003 ENTR	
o. VERB 31 ENTR	
14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.	
15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	
16. Enter VERB 36 and press ENTR pushbutton on DSKY.	16. Press EXECUTE pushbutton on Programmer and Monitor panel.
17. Perform following DSKY operations:	17. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 27 ENTR	
b. 01000 ENTR	
c. VERB 30 ENTR	
18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.	
19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	
20. Enter VERB 36 and press ENTR pushbutton on DSKY.	20. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
TC TRAP TEST	TC TRAP TEST
21. Perform following DKSY operations:	21. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 02 ENTR	21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 21 NOUN 02 Flashing	21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 02 Flashing	21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 01600 ENTR	21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. VERB 25 NOUN 26 ENTR	
g. Observe: VERB 21 NOUN 26 Flashing	
h. 04000 ENTR	
i. Observe: VERB 22 NOUN 26 Flashing	
j. 01600 ENTR	
k. Observe: VERB 23 NOUN 26 Flashing	
l. 00003 ENTR	
m. VERB 30 ENTR	
22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.	
23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	
24. Enter VERB 36 and press ENTR pushbutton on DSKY.	24. Press EXECUTE pushbutton on Programmer and Monitor panel.

FORM 00145
CL. 7-23-65

MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

MANUAL LOAD PROCEDURES

28. Enter VERB 36 and press ENTR pushbutton on DSKY.

T5/T6 RUPT TEST

29. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01300		ENTR
c. 31304		ENTR
d. NOUN 15		ENTR
e. 00006		ENTR ENTR
f. 05013		ENTR ENTR
g. 04511		ENTR ENTR
h. 40000		ENTR ENTR
i. 31312		ENTR ENTR
j. 54030		ENTR ENTR
k. 31313		ENTR ENTR
l. 54345		ENTR ENTR
m. 04353		ENTR ENTR
n. 36027		ENTR ENTR
o. 01314		ENTR ENTR
p. 00006		ENTR ENTR
q. 22012		ENTR ENTR
r. 22016		ENTR ENTR
s. 04572		ENTR ENTR
t. 00011		ENTR ENTR
u. 01300		ENTR
v. VERB 25	NOUN 26	ENTR
w. 01000		ENTR
x. 01305		ENTR
y. 00002		ENTR
z. VERB 21	NOUN 01	ENTR
aa. 00031		ENTR
ab. 37777		ENTR
ac. VERB 11	NOUN 01	ENTR
ad. 00031		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

and Monitor panel. All CTS alarm indications shall go out.

28. Press EXECUTE pushbutton on Programmer and Monitor panel.

T5/T6 RUPT TEST

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

32. Enter VERB 30 and press ENTR pushbutton on DSKY.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.

34. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. 00031		ENTR
d. 40000		ENTR
e. VERB 11	NOUN 01	ENTR
f. 00031		ENTR

35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

36. Enter VERB 30 and press ENTR pushbutton on DSKY.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.

CTS UPLINK TAPE LOAD PROCEDURES

30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Verify that RG display does not indicate 34055.

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.

34. Press EXECUTE pushbutton on Programmer and Monitor panel.

35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.

36. Press EXECUTE pushbutton on Programmer and Monitor panel.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

MANUAL LOAD PROCEDURES

38. Enter VERB 36 and press ENTR pushbutton on DSKY.

RADAR RUPT TEST

39. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR

40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

41. Enter VERB 30 and press ENTR pushbutton on DSKY.

42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.

44. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR

45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

CTS UPLINK TAPE LOAD PROCEDURES

38. Press EXECUTE pushbutton on Programmer and Monitor panel.

RADAR RUPT TEST

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
61. Enter VERB 30 and press ENTR pushbutton on DSKY.	61. Press EXECUTE pushbutton on Programmer and Monitor panel.
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
65. Enter VERB 30 and press ENTR pushbutton on DSKY.	65. Press EXECUTE pushbutton on Programmer and Monitor panel.
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
69. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	69. Press EXECUTE pushbutton on Programmer and Monitor panel.
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Porgrammer and Monitor panel indicates zero.	89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
93. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.	94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.	
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.	
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.	
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.	
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.	
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.	
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.	
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.	
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
136. Enter VERB 36 and press ENTR pushbutton on DSKY.	136. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
LGC SELF CHECK	LGC SELF CHECK
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767	137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.	NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
PIPA AND IRIG TEST (Nominal Voltage)	PIPA AND IRIG TEST (Nominal Voltage)
138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.	145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (Low Voltage)	PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.	149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR	150. Press EXECUTE pushbutton on Programmer and Monitor panel 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.	153. Press EXECUTE pushbutton on Programmer and Monitor panel.
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (High Voltage)	PIPA AND IRIG TEST (High Voltage)
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication	

MANUAL LOAD PROCEDURES

157. Enter VERB 36 and press ENTR pushbutton on DSKY.

158. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe:
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.

159. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe:
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.

161. Enter VERB 33 and press ENTR pushbutton on DSKY.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Enter VERB 36 and press ENTR pushbutton on DSKY.

CTS UPLINK TAPE LOAD PROCEDURES

157. Press EXECUTE pushbutton on Programmer and Monitor panel

158. Press EXECUTE pushbutton on Programmer and Monitor panel.

158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displaed on DSKY. If no failure occurs, write "none" on data sheet.

159. Press EXECUTE pushbutton on Programmer and Monitor panel.

159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

161. Press EXECUTE pushbutton on Programmer and Monitor panel.

163. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

CTS UPLINK TAPE LOAD PROCEDURES

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digitswitches to XXXXXXXX.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. P INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec^2	975.0	R1 R2	985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec^2	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. P

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50		
158	LGC self check failures						
160	gravity	cm/sec^2	975.0		985.9		
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

Horizontal Earth Rate Tolerances

Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS;

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
J	1-11-68	35386	3	All	EA	-
K	4-9-68	36044	All	All	EA	-
L	7-25-68	36585	2,3	-	EA	-
M	10-24-68	36957	All	All	EA	
N	2-24-69	37364	19	-	EA	-
P	3-27-69	37451	4, 10	-	EA	-
R	5-26-70	38139	1, 27, 28, 29, 30	2	EA	-

REFERENCES
PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

panel lighted.

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.

2. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHTWATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N 2014042-071 only
ALARMS #18 - E-MEMORY PARITY FAIL

DSKY CHECK

2. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3 } on concurrently for approx. 5 seconds
l. VERB-NOUN Flashing
m. COMP ACTY
n. Plus signs in Row 1, Row 2, and Row 3 } on concurrently for approx. 5 seconds
o. VERB-NOUN Flashing
p. COMP ACTY

q. COMP ACTY on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1, Row 2, and Row 3

} on concurrently for approx. 5 seconds

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. Observe: VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe: VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe: VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12617 CTS UPLINK Tape, P/N 2901655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
c. Logic Drawer No. 2 - Set AGREEMENT B digitswitches to X12X3672. Set AGREEMENT B switch to STOP.
d. RDC Interface panel - Press to light CH33-10 pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	and Monitor panel and RSET pushbutton on DSKY.
	f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.
	g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.
ALARM AND INTERRUPT TEST PARITY FAIL TEST	ALARM AND INTERRUPT TEST PARITY FAIL TEST
8. Perform following DSKY operations:	8. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 21 NOUN 01 ENTR	8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.
c. Observe: VERB 21 NOUN 01 Flashing	
d. 01365 ENTR	
e. 00000 ENTR	
f. VERB 27 NOUN 01 ENTR	
g. Observe: VERB 27 NOUN 01 Flashing	
h. 70000 ENTR	

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.
	10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.
	11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
12. Enter VERB 36 and press ENTR pushbutton on DSKY.	12. Press EXECUTE pushbutton on Programmer and Monitor panel.
RUPT LOCK	RUPT LOCK
13. Perform following DSKY operations:	13. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 24 NOUN 01 Flashing	13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 01 Flashing	13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 30001 ENTR	13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe: VERB 22 NOUN 01 Flashing	13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
g. 01600 ENTR	
h. VERB 25 NOUN 26 ENTR	
i. Observe: VERB 21 NOUN 26 Flashing	
j. 00001 ENTR	
k. Observe: VERB 22 NOUN 26 Flashing	
l. 01600 ENTR	
m. Observe: VERB 23 NOUN 26 Flashing	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
n. 00003 ENTR	
o. VERB 31 ENTR	

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.	16. Press EXECUTE pushbutton on Programmer and Monitor panel.
17. Perform following DSKY operations:	17. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 27 ENTR	
b. 01000 ENTR	
c. VERB 30 ENTR	

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.	20. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
TC TRAP TEST	TC TRAP TEST
21. Perform following DKSY operations:	21. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 02 ENTR	21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 21 NOUN 02 Flashing	21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 02 Flashing	21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 01600 ENTR	21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. VERB 25 NOUN 26 ENTR	
g. Observe: VERB 21 NOUN 26 Flashing	
h. 04000 ENTR	
i. Observe: VERB 22 NOUN 26 Flashing	
j. 01600 ENTR	
k. Observe: VERB 23 NOUN 26 Flashing	
l. 00003 ENTR	
m. VERB 30 ENTR	

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are ligated. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.	24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

28. Enter VERB 36 and press ENTR pushbutton on DSKY.

T5/T6 RUPT TEST

29. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01300		ENTR
c. 31304		ENTR
d. NOUN 15		ENTR
e. 00006		ENTR ENTR
f. 05013		ENTR ENTR
g. 04511		ENTR ENTR
h. 40000		ENTR ENTR
i. 31312		ENTR ENTR
j. 54030		ENTR ENTR
k. 31313		ENTR ENTR
l. 54345		ENTR ENTR
m. 04353		ENTR ENTR
n. 36027		ENTR ENTR
o. 01314		ENTR ENTR
p. 00006		ENTR ENTR
q. 22012		ENTR ENTR
r. 22016		ENTR ENTR
s. 04572		ENTR ENTR
t. 00011		ENTR ENTR
u. 01300		ENTR
v. VERB 25	NOUN 26	ENTR
w. 01000		ENTR
x. 01305		ENTR
y. 00002		ENTR
z. VERB 21	NOUN 01	ENTR
aa. 00031		ENTR
ab. 37777		ENTR
ac. VERB 11	NOUN 01	ENTR
ad. 00031		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

28. Press EXECUTE pushbutton on Programmer and Monitor panel.

T5/T6 RUPT TEST

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

32. Enter VERB 30 and press ENTR pushbutton on DSKY.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.

34. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. 00031		ENTR
d. 40000		ENTR
e. VERB 11	NOUN 01	ENTR
f. 00031		ENTR

35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

36. Enter VERB 30 and press ENTR pushbutton on DSKY.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.

CTS UPLINK TAPE LOAD PROCEDURES

30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Verify that RG display does not indicate 34055.

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.

34. Press EXECUTE pushbutton on Programmer and Monitor panel.

35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.

36. Press EXECUTE pushbutton on Programmer and Monitor panel.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

MANUAL LOAD PROCEDURES

38. Enter VERB 36 and press ENTR pushbutton on DSKY.

RADAR RUPT TEST

39. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR

40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

41. Enter VERB 30 and press ENTR pushbutton on DSKY.

42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.

44. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR

45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

CTS UPLINK TAPE LOAD PROCEDURES

38. Press EXECUTE pushbutton on Programmer and Monitor panel.

RADAR RUPT TEST

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
61. Enter VERB 30 and press ENTR pushbutton on DSKY.	61. Press EXECUTE pushbutton on Programmer and Monitor panel.
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
65. Enter VERB 30 and press ENTR pushbutton on DSKY.	65. Press EXECUTE pushbutton on Programmer and Monitor panel.
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
69. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	69. Press EXECUTE pushbutton on Programmer and Monitor panel.
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Porgrammer and Monitor panel indicates zero.	89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
93. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.	94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.	
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.	
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.	
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.	
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.	
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	116. Pres to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.	
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.	
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.	
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
136. Enter VERB 36 and press ENTR pushbutton on DSKY.	136. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
LGC SELF CHECK	LGC SELF CHECK
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767	137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.	NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
PIPA AND IRIG TEST (Nominal Voltage)	PIPA AND IRIG TEST (Nominal Voltage)
138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.	145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (Low Voltage)	PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.	149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR	150. Press EXECUTE pushbutton on Programmer and Monitor panel 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.	153. Press EXECUTE pushbutton on Programmer and Monitor panel.
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (High Voltage)	PIPA AND IRIG TEST (High Voltage)
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
157. Enter VERB 36 and press ENTR pushbutton on DSKY.	157. Press EXECUTE pushbutton on Programmer and Monitor panel
158. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	158. Press EXECUTE pushbutton on Programmer and Monitor panel. 158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displaed on DSKY. If no failure occurs, write "none" on data sheet.
159. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	159. Press EXECUTE pushbutton on Programmer and Monitor panel. 159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel 159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
161. Enter VERB 33 and press ENTR pushbutton on DSKY.	161. Press EXECUTE pushbutton on Programmer and Monitor panel.
162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
163. Enter VERB 36 and press ENTR pushbutton on DSKY.	163. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.	
	166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.
	167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.
	168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digitswitches to XXXXXXXX.
	169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.
	170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	NOTE: The remaining procedures of this JDC apply only when Restart Monitor module (2898989) is installed.
171. Downmode the system to OIA On mode according to procedure given in JDC 12614.	
172. Remove W226-P1 from LGC test connector.	
	CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.
173. Install Restart Monitor module on LGC test connector as follows: a. Carefully locate module on guide pins of LGC test connector maintaining parallelism between module and test connector as closely as possible and engage the four corner jackscrews until finger tight. b. To fully engage module to computer, turn each jackscrew one quarter turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lb.	
174. Advance system to ISS STANDBY mode according to the procedure given in JDC 12614.	
175. Perform the following DSKY operations: a. VERB 27 NOUN 01 ENTR b. 07700 ENTR c. Observe that RESTART lamp on the DSKY lights. d. VERB 01 NOUN 10 ENTR e. 00077 ENTR f. The contents of Row 1 on the DSKY shall be 00001 or 00101.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	176. Reset contents of Restart Monitor to zero by performing DSKY entries as follows: a. VERB 21 NOUN 10 ENTR b. 00077 ENTR c. 00000 ENTR d. Press RSET pushbutton.
	177. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01300 ENTR c. 31304 ENTR d. NOUN 15 ENTR e. 54067 ENTR ENTR f. 31305 ENTR ENTR g. 54001 ENTR ENTR h. 14613 ENTR ENTR i. 00067 ENTR j. VERB 25 NOUN 26 ENTR k. 00001 ENTR l. 01300 ENTR m. 00000 ENTR n. VERB 31 ENTR o. Observe that RESTART lamp on DKSY lights p. VERB 01 NOUN 10 ENTR q. 00077 ENTR r. The contents of Row 1 on the DSKY shall be 0004 of 00104.
	178. Reset contents of Restart Monitor to zero by performing DSKY entries as follows: a. VERB 21 NOUN 10 ENTR b. 00077 ENTR c. 00000 ENTR d. Press RSET pushbutton

179. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01300 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 31 ENTR
k. Observe that the RESTART lamp on DSKY lights
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

180. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

181. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 30000 ENTR
d. NOUN 15 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 02000 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 30 ENTR

k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

182. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

183. Set Crossbar Control on OIA to 175 to monitor +28 VDC on the DVM.

184. Using the G&N power ADJUST control on the TEST CONTROL panel, slowly decrease the +28 VDC until the RESTART lamp on the DSKY lights. Return the +28 VDC to 28.0 ± 0.25 VDC.

185. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 on the DSKY shall be 00XAX, where A can be 4, 5, 6, or 7 due to multiple failures.

186. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

187. Record compliance of DSKY displays for steps 175, 177, 179, 181, and 185.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. R INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE ____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME ____ SER. NO. ____ CAL DATE
NAME ____ SER. NO. ____ CAL DATE

CONDUCTED BY ____ NAME/AFFILIATION APPROVED BY ____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec^2	975.0	R1 R2 -----, -----	985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec^2	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

DATE 15 MAR 66
FORM 00146
Chg. 7-23-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. R

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50		
158	LGC self check failures						
160	gravity	cm/sec^2	975.0		985.9		
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
186	Displays			All characters and lamps performed as required.			

Horizontal Earth Rate Tolerances

Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS;

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
J	1-11-68	35386	3	All	EA	-
K	4-9-68	36044	All	All	EA	-
L	7-25-68	36585	2, 3	-	EA	-
M	10-24-68	36957	All	All	EA	
N	2-24-69	37364	19	-	EA	-
P	3-27-69	37451	4, 10	-	EA	-
R	5-26-70	38139	1, 27, 28, 29, 30	2	EA	-
S	9-4-70	38203	30	2	JS	-

REFERENCES
PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

panel lighted.

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.

2. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHTWATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N 2014042-071 only
ALARMS #18 - E-MEMORY PARITY FAIL

DSKY CHECK

2. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21, NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:
a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3 } on concurrently for approx. 5 seconds
l. VERB-NOUN Flashing
m. COMP ACTY
n. Plus signs in Row 1, Row 2, and Row 3 } on concurrently for approx. 5 seconds
o. VERB-NOUN Flashing
p. COMP ACTY

q. COMP ACTY } on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:
a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1, Row 2, and Row 3
} on concurrently for approx. 5 seconds

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe: VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe: VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe: VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12617 CTS UPLINK Tape, P/N 2901655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
c. Logic Drawer No. 2 - Set AGREEMENT B digitswitches to X12X3672. Set AGREEMENT B switch to STOP.
d. RDC Interface panel - Press to light CH33-10 pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

and Monitor panel and RSET pushbutton on DSKY.

f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. Observe:		
VERB 21	NOUN 01	Flashing
d. 01365		ENTR
e. 00000		ENTR
f. VERB 27	NOUN 01	ENTR
g. Observe:		
VERB 27	NOUN 01	Flashing
h. 70000		ENTR

ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Press EXECUTE pushbutton on Programmer and Monitor panel.

8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.

10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.

11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

12. Enter VERB 36 and press ENTR pushbutton on DSKY.

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

RUPT LOCK

13. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 00001		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing

RUPT LOCK

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

n. 00003		ENTR
o. VERB 31		ENTR

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.

16. Press EXECUTE pushbutton on Programmer and Monitor panel.

17. Perform following DSKY operations:

a. VERB 21	NOUN 27	ENTR
b. 01000		ENTR
c. VERB 30		ENTR

17. Press EXECUTE pushbutton on Programmer and Monitor panel.

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.

20. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

TC TRAP TEST

21. Perform following DKSY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe:		
VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 02	Flashing
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe:		
VERB 21	NOUN 26	Flashing
h. 04000		ENTR
i. Observe:		
VERB 22	NOUN 26	Flashing
j. 01600		ENTR
k. Observe:		
VERB 23	NOUN 26	Flashing
l. 00003		ENTR
m. VERB 30		ENTR

TC TRAP TEST

21. Press EXECUTE pushbutton on Programmer and Monitor panel.

21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.

24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

MANUAL LOAD PROCEDURES

28. Enter VERB 36 and press ENTR pushbutton on DSKY.

T5/T6 RUPT TEST

29. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01300		ENTR
c. 31304		ENTR
d. NOUN 15		ENTR
e. 00006		ENTR ENTR
f. 05013		ENTR ENTR
g. 04511		ENTR ENTR
h. 40000		ENTR ENTR
i. 31312		ENTR ENTR
j. 54030		ENTR ENTR
k. 31313		ENTR ENTR
l. 54345		ENTR ENTR
m. 04353		ENTR ENTR
n. 36027		ENTR ENTR
o. 01314		ENTR ENTR
p. 00006		ENTR ENTR
q. 22012		ENTR ENTR
r. 22016		ENTR ENTR
s. 04572		ENTR ENTR
t. 00011		ENTR ENTR
u. 01300		ENTR
v. VERB 25	NOUN 26	ENTR
w. 01000		ENTR
x. 01305		ENTR
y. 00002		ENTR
z. VERB 21	NOUN 01	ENTR
aa. 00031		ENTR
ab. 37777		ENTR
ac. VERB 11	NOUN 01	ENTR
ad. 00031		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

28. Press EXECUTE pushbutton on Programmer and Monitor panel.

T5/T6 RUPT TEST

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

32. Enter VERB 30 and press ENTR pushbutton on DSKY.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.

34. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. 00031		ENTR
d. 40000		ENTR
e. VERB 11	NOUN 01	ENTR
f. 00031		ENTR

35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

36. Enter VERB 30 and press ENTR pushbutton on DSKY.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.

CTS UPLINK TAPE LOAD PROCEDURES

30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Verify that RG display does not indicate 34055.

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.

34. Press EXECUTE pushbutton on Programmer and Monitor panel.

35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.

36. Press EXECUTE pushbutton on Programmer and Monitor panel.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

MANUAL LOAD PROCEDURES

38. Enter VERB 36 and press ENTR pushbutton on DSKY.

RADAR RUPT TEST

39. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR

40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

41. Enter VERB 30 and press ENTR pushbutton on DSKY.

42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.

44. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR

45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

CTS UPLINK TAPE LOAD PROCEDURES

38. Press EXECUTE pushbutton on Programmer and Monitor panel.

RADAR RUPT TEST

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
61. Enter VERB 30 and press ENTR pushbutton on DSKY.	61. Press EXECUTE pushbutton on Programmer and Monitor panel.
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
65. Enter VERB 30 and press ENTR pushbutton on DSKY.	65. Press EXECUTE pushbutton on Programmer and Monitor panel.
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
69. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	69. Press EXECUTE pushbutton on Programmer and Monitor panel.
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Porgrammer and Monitor panel indicates zero.	89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
93. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.	94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.	
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.	
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.	
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.	
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.	
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	116. Pres to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.	
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.	
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.	
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
136. Enter VERB 36 and press ENTR pushbutton on DSKY.	136. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
LGC SELF CHECK	LGC SELF CHECK
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767	137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.	NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
PIPA AND IRIG TEST (Nominal Voltage)	PIPA AND IRIG TEST (Nominal Voltage)
138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.	145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (Low Voltage)	PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.	149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR	150. Press EXECUTE pushbutton on Programmer and Monitor panel 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.	153. Press EXECUTE pushbutton on Programmer and Monitor panel.
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (High Voltage)	PIPA AND IRIG TEST (High Voltage)
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.	

MANUAL LOAD PROCEDURES

157. Enter VERB 36 and press ENTR pushbutton on DSKY.

158. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe:
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.

159. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe:
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

157. Press EXECUTE pushbutton on Programmer and Monitor panel

158. Press EXECUTE pushbutton on Programmer and Monitor panel.

158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displaed on DSKY. If no failure occurs, write "none" on data sheet.

159. Press EXECUTE pushbutton on Programmer and Monitor panel.

159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.

161. Enter VERB 33 and press ENTR pushbutton on DSKY.

161. Press EXECUTE pushbutton on Programmer and Monitor panel.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Enter VERB 36 and press ENTR pushbutton on DSKY.

163. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

CTS UPLINK TAPE LOAD PROCEDURES

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digitswitches to XXXXXXXX.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

MANUAL LOAD PROCEDURES

NOTE: The remaining procedures of this JDC apply only when Restart Monitor module (2898989) is installed.

171. Downmode the system to OIA On mode according to procedure given in JDC 12614.

172. Remove W226-P1 from LGC test connector.

CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.

173. Install Restart Monitor module on LGC test connector as follows:

a. Carefully locate module on guide pins of LGC test connector maintaining parallelism between module and test connector as closely as possible and engage the four corner jackscrews until finger tight.
b. To fully engage module to computer, turn each jackscrew one quarter turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lb.

174. Advance system to ISS STANDBY mode according to the procedure given in JDC 12614.

175. Perform the following DSKY operations:

a. VERB 27 NOUN 01 ENTR
b. 07700 ENTR
c. Observe that RESTART lamp on the DSKY lights.
d. VERB 01 NOUN 10 ENTR
e. 00077 ENTR
f. The contents of Row 1 on the DSKY shall be 00001 or 00101.

CTS UPLINK TAPE LOAD PROCEDURES

MANUAL LOAD PROCEDURES

176. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

177. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 54067 ENTR ENTR
f. 31305 ENTR ENTR
g. 54001 ENTR ENTR
h. 14613 ENTR ENTR
i. 00067 ENTR
j. VERB 25 NOUN 26 ENTR
k. 00001 ENTR
l. 01300 ENTR
m. 00000 ENTR
n. VERB 31 ENTR
o. Observe that RESTART lamp on DKSY lights
p. VERB 01 NOUN 10 ENTR
q. 00077 ENTR
r. The contents of Row 1 on the DSKY shall be 0004 of 00104.

178. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton

CTS UPLINK TAPE LOAD PROCEDURES

179. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01300 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 31 ENTR
k. Observe that the RESTART lamp on DSKY lights
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

180. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

181. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 30000 ENTR
d. NOUN 15 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 02000 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 30 ENTR

k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

182. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

183. Record compliance of DSKY displays for steps 175, 177, 179, and 181.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC NO. 12617 REV. S INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec^2	975.0	R1 R2 ------, ------	985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec^2	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC NO. 12617 REV. S

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50		
158	LGC self check failures						
160	gravity	cm/sec^2	975.0		985.9		
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
183	Displays			All characters and lamps performed as required.			

Horizontal Earth Rate Tolerances

Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS;

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-25-66	29177	2-5	All	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
F	7-27-67	34232	1	-	EA	-
G	8-31-67	34457	3,4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
J	1-11-68	35386	3	All	EA	-
K	4-9-68	36044	All	All	EA	-
L	7-25-68	36585	2, 3	-	EA	-
M	10-24-68	36957	All	All	EA	
N	2-24-69	37364	19	-	EA	-
P	3-27-69	37451	4, 10	-	EA	-
R	5-26-70	38139	1, 27, 28, 29, 30	2	EA	-
S	9-4-70	38203	30	2	JS	-
T	5-10-71	38414	27, 30, 31	2, 3	EA	-

REFERENCES
PS 6015000

IMPORTANT See below.

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

panel lighted.

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.

2. CTS ALARMS lamps indicate the following alarms when lighted:

ALARMS #1 - RUPT LOC
ALARMS #2 - CTR FAIL
ALARMS #3 - TC TRAP
ALARMS #4 - OSCILLATOR FAIL
ALARMS #5 - NIGHTWATCHMAN
ALARMS #6 - PIPA FAIL
ALARMS #7 - VOLTAGE FAIL
ALARMS #8 - SCALER FAIL
ALARMS #9 - WARNING FILTER
ALARMS #12 - DOUBLE SCALER
ALARMS #15 - GOJAM CTS P/N 2014042-071 only
ALARMS #18 - E-MEMORY PARITY FAIL

DSKY CHECK

2. Perform following DSKY operations:
a. VERB 36 ENTR
b. VERB 21 NOUN 27 ENTR
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:
a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's
j. 0's
k. Minus signs in Row 1, Row 2, and Row 3
l. VERB-NOUN Flashing
m. COMP ACTY
(k–m: on concurrently for approx. 5 seconds)
n. Plus signs in Row 1, Row 2, and Row 3
o. VERB-NOUN Flashing
p. COMP ACTY
(n–p: on concurrently for approx. 5 seconds)

q. COMP ACTY — on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:
a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL Flashing
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERR Flashing
k. VERB-NOUN Flashing
l. Plus 88888 in Row 1, Row 2, and Row 3
(a–l: on concurrently for approx. 5 seconds)

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:
a. VERB 24 NOUN 01 ENTR
b. Observe: VERB 24 NOUN 01 Flashing
c. 01700 ENTR
d. Observe: VERB 21 NOUN 01 Flashing
e. +12345 ENTR
f. Observe: VERB 22 NOUN 01 Flashing
g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:
None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:
JDC 12617 CTS UPLINK Tape, P/N 2901655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.
c. Logic Drawer No. 2 - Set AGREEMENT B digitswitches to X12X3672. Set AGREEMENT B switch to STOP.
d. RDC Interface panel - Press to light CH33-10 pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	and Monitor panel and RSET pushbutton on DSKY.
	f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.
	g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.
ALARM AND INTERRUPT TEST PARITY FAIL TEST	ALARM AND INTERRUPT TEST PARITY FAIL TEST
8. Perform following DSKY operations:	8. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 36 ENTR	8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 21 NOUN 01 ENTR	8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.
c. Observe: VERB 21 NOUN 01 Flashing	
d. 01365 ENTR	
e. 00000 ENTR	
f. VERB 27 NOUN 01 ENTR	
g. Observe: VERB 27 NOUN 01 Flashing	
h. 70000 ENTR	

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.
	10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.
	11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
12. Enter VERB 36 and press ENTR pushbutton on DSKY.	12. Press EXECUTE pushbutton on Programmer and Monitor panel.
RUPT LOCK	RUPT LOCK
13. Perform following DSKY operations:	13. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24 NOUN 01 ENTR	13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 24 NOUN 01 Flashing	13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 01 Flashing	13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 30001 ENTR	13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe: VERB 22 NOUN 01 Flashing	13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
g. 01600 ENTR	
h. VERB 25 NOUN 26 ENTR	
i. Observe: VERB 21 NOUN 26 Flashing	
j. 00001 ENTR	
k. Observe: VERB 22 NOUN 26 Flashing	
l. 01600 ENTR	
m. Observe: VERB 23 NOUN 26 Flashing	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
n. 00003 ENTR	
o. VERB 31 ENTR	

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.	16. Press EXECUTE pushbutton on Programmer and Monitor panel.
17. Perform following DSKY operations:	17. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 27 ENTR	
b. 01000 ENTR	
c. VERB 30 ENTR	

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.	20. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
TC TRAP TEST	TC TRAP TEST
21. Perform following DKSY operations:	21. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21 NOUN 02 ENTR	21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 21 NOUN 02 Flashing	21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 01600 ENTR	21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 21 NOUN 02 Flashing	21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. 01600 ENTR	21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. VERB 25 NOUN 26 ENTR	
g. Observe: VERB 21 NOUN 26 Flashing	
h. 04000 ENTR	
i. Observe: VERB 22 NOUN 26 Flashing	
j. 01600 ENTR	
k. Observe: VERB 23 NOUN 26 Flashing	
l. 00003 ENTR	
m. VERB 30 ENTR	

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.	24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NIGHT WATCHMAN TEST

25. Press EXECUTE pushbutton on Programmer and Monitor panel.

25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

and Monitor panel. All CTS alarm indications shall go out.

28. Enter VERB 36 and press ENTR pushbutton on DSKY.

28. Press EXECUTE pushbutton on Programmer and Monitor panel.

T5/T6 RUPT TEST

29. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01300		ENTR
c. 31304		ENTR
d. NOUN 15		ENTR
e. 00006		ENTR ENTR
f. 05013		ENTR ENTR
g. 04511		ENTR ENTR
h. 40000		ENTR ENTR
i. 31312		ENTR ENTR
j. 54030		ENTR ENTR
k. 31313		ENTR ENTR
l. 54345		ENTR ENTR
m. 04353		ENTR ENTR
n. 36027		ENTR ENTR
o. 01314		ENTR ENTR
p. 00006		ENTR ENTR
q. 22012		ENTR ENTR
r. 22016		ENTR ENTR
s. 04572		ENTR ENTR
t. 00011		ENTR ENTR
u. 01300		ENTR
v. VERB 25	NOUN 26	ENTR
w. 01000		ENTR
x. 01305		ENTR
y. 00002		ENTR
z. VERB 21	NOUN 01	ENTR
aa. 00031		ENTR
ab. 37777		ENTR
ac. VERB 11	NOUN 01	ENTR
ad. 00031		ENTR

T5/T6 RUPT TEST

29. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

32. Enter VERB 30 and press ENTR pushbutton on DSKY.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.

34. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. 00031		ENTR
d. 40000		ENTR
e. VERB 11	NOUN 01	ENTR
f. 00031		ENTR

35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

36. Enter VERB 30 and press ENTR pushbutton on DSKY.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.

CTS UPLINK TAPE LOAD PROCEDURES

30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.

31. Verify that RG display does not indicate 34055.

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.

34. Press EXECUTE pushbutton on Programmer and Monitor panel.

35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.

36. Press EXECUTE pushbutton on Programmer and Monitor panel.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

MANUAL LOAD PROCEDURES

38. Enter VERB 36 and press ENTR pushbutton on DSKY.

RADAR RUPT TEST

39. Perform following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR

40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

41. Enter VERB 30 and press ENTR pushbutton on DSKY.

42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

CTS UPLINK TAPE LOAD PROCEDURES

38. Press EXECUTE pushbutton on Programmer and Monitor panel.

RADAR RUPT TEST

39. Press EXECUTE pushbutton on Programmer and Monitor panel.

40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.

41. Press EXECUTE pushbutton on Programmer and Monitor panel.

42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.

T10 RUPT TEST

43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.

44. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR

45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

44. Press EXECUTE pushbutton on Programmer and Monitor panel.

45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
61. Enter VERB 30 and press ENTR pushbutton on DSKY.	61. Press EXECUTE pushbutton on Programmer and Monitor panel.
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
65. Enter VERB 30 and press ENTR pushbutton on DSKY.	65. Press EXECUTE pushbutton on Programmer and Monitor panel.
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.	
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
69. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 10000 ENTR d. VERB 30 ENTR	69. Press EXECUTE pushbutton on Programmer and Monitor panel.
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.	
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.	
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.	
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.	
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Porgrammer and Monitor panel indicates zero.	89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.	
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
93. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01304 ENTR c. 20000 ENTR d. VERB 11 NOUN 10 ENTR e. 00032 ENTR	93. Press EXECUTE pushbutton on Programmer and Monitor panel.
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.	94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.	
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.	
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.	
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	107. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.	
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.	
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	116. Pres to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.	
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.	
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.	
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.	132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.	133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
136. Enter VERB 36 and press ENTR pushbutton on DSKY.	136. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
LGC SELF CHECK	LGC SELF CHECK
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767	137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.	NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
PIPA AND IRIG TEST (Nominal Voltage)	PIPA AND IRIG TEST (Nominal Voltage)
138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.	145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (Low Voltage)	PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.	149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 ENTR	150. Press EXECUTE pushbutton on Programmer and Monitor panel 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 ENTR d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR	151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.	153. Press EXECUTE pushbutton on Programmer and Monitor panel.
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
PIPA AND IRIG TEST (High Voltage)	PIPA AND IRIG TEST (High Voltage)
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.	

MANUAL LOAD PROCEDURES

157. Enter VERB 36 and press ENTR pushbutton on DSKY.

158. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR
b. Observe:
VERB 21 NOUN 27 Flashing
c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.

159. Perform following DSKY operations:

a. VERB 57 ENTR
b. Observe:
VERB 21 NOUN 01 Flashing
c. 00004 ENTR
d. Observe:
VERB 16 NOUN 20 Displayed
e. VERB 34 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

157. Press EXECUTE pushbutton on Programmer and Monitor panel

158. Press EXECUTE pushbutton on Programmer and Monitor panel.

158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displaed on DSKY. If no failure occurs, write "none" on data sheet.

159. Press EXECUTE pushbutton on Programmer and Monitor panel.

159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel

159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.

161. Enter VERB 33 and press ENTR pushbutton on DSKY.

161. Press EXECUTE pushbutton on Programmer and Monitor panel.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Enter VERB 36 and press ENTR pushbutton on DSKY.

163. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digitswitches to XXXXXXXX.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: The procedures of step 171 through step 183 and step 186 apply only when Restart Monitor module (2898989) is installed.

171. Downmode the system to OIA On mode according to procedure given in JDC 12614.

172. Remove W226-P1 from LGC test connector.

CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.

173. Install Restart Monitor module on LGC test connector as follows:

a. Carefully locate module on guide pins of LGC test connector maintaining parallelism between module and test connector as closely as possible and engage the four corner jackscrews until finger tight.
b. To fully engage module to computer, turn each jackscrew one quarter turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lb.

174. Advance system to ISS STANDBY mode according to the procedure given in JDC 12614.

175. Perform the following DSKY operations:

a. VERB 27 NOUN 01 ENTR
b. 07700 ENTR
c. Observe that RESTART lamp on the DSKY lights.
d. VERB 01 NOUN 10 ENTR
e. 00077 ENTR
f. The contents of Row 1 on the DSKY shall be 00001 or 00101.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

176. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

177. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 31304 ENTR
d. NOUN 15 ENTR
e. 54067 ENTR ENTR
f. 31305 ENTR ENTR
g. 54001 ENTR ENTR
h. 14613 ENTR ENTR
i. 00067 ENTR
j. VERB 25 NOUN 26 ENTR
k. 00001 ENTR
l. 01300 ENTR
m. 00000 ENTR
n. VERB 31 ENTR
o. Observe that RESTART lamp on DKSY lights
p. VERB 01 NOUN 10 ENTR
q. 00077 ENTR
r. The contents of Row 1 on the DSKY shall be 00004 or 00104.

178. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton

179. Perform the following DSKY operations:

a. VERB 25 NOUN 01 ENTR
b. 01300 ENTR
c. 00004 ENTR
d. 30067 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 00001 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 31 ENTR
k. Observe that the RESTART lamp on DSKY lights
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

180. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

181. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01300 ENTR
c. 30000 ENTR
d. NOUN 15 ENTR
e. 01300 ENTR
f. VERB 25 NOUN 26 ENTR
g. 02000 ENTR
h. 01300 ENTR
i. 00000 ENTR
j. VERB 30 ENTR

k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.
l. VERB 01 NOUN 10 ENTR
m. 00077 ENTR
n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

182. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

183. Record compliance of DSKY displays for steps 175, 177, 179, and 181.

NOTE: The procedures of step 184 and step 185 apply only to G&N 604 and up.

184. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 21 NOUN 01 ENTR
c. 00322 ENTR
d. 40004 ENTR
e. Verify that VEL lamp on DSKY is lighted.
f. VERB 21 NOUN 01 ENTR
g. 00322 ENTR
h. 40020 ENTR
j. Verify that ALT lamp on DSKY is lighted and VEL lamp is not lit.
k. VERB 21 NOUN 01 ENTR
l. 00322 ENTR
m. 40001 ENTR
n. Verify that upper spare lamp on DSKY is lighted and that VEL and ALT lamps are not lit.

o. VERB 21 NOUN 01 ENTR
p. 00322 ENTR
r. 40002 ENTR
s. Verify that lower spare lamp on DSKY is lighted and that VEL, ALT and upper spare lamp are not lit.
t. Record response of DSKY displays on Data Sheet.
u. VERB 36 ENTR

185. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR
b. 00032 ENTR
c. Verify that Row 1 of DSKY display is 7XXXX.
d. Press and hold PRO pushbutton until instructed to release pushbutton.
e. Verify that Row 1 of DSKY display changes to 5XXXX.
f. Release PRO pushbutton.
g. Verify that DSKY Row 1 display changes to 7XXXX.
h. Record response of DSKY display on Data sheet.
j. VERB 34 ENTR

186. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. Verify contents of Row 1 of DSKY display is 00000.
d. Record display of Row 1 on DSKY on Data sheet.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 3

JDC NO. 12617
REV. T
INITIAL TDRR 27134

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec^2	975.0	R1 R2 ------. ------	985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec^2	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 3

JDC NO. 12617 REV. T

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50		
158	LGC self check failures						
160	gravity	cm/sec^2	975.0		985.9		
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
183	Displays			All characters and lamps performed as required.			
184	Displays			DSKY lamps performed as required.			
185	Displays			DSKY Row 1 display performed as required.			
186	Displays			DSKY Row 1 display correct			

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 3

JDC NO. 12617 REV. T

JOB G & N SYSTEM OPERATIONAL TEST

Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

DATE 15 MAR 66

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I_A is sensing some portion of positive g and the accumulative PIPA

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	D.S.	APPROVAL MIT	NASA	REFERENCES
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21	Noun 27	ENTR
00011		ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's
b. 8's
c. 7's
d. 6's
e. 5's
f. 4's
g. 3's
h. 2's
i. 1's

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

j. 0's
k. Minus signs in ROW 1, ROW 2, ROW 3
l. VERB-NOUN Flashing
m. COMP ACTY
} on concurrently for 5 seconds

o. Plus signs in ROW 1, ROW 2, ROW 3
p. VERB-NOUN Flashing
q. COMP ACTY
} on currently for 5 seconds

r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY
b. NO ATT
c. STBY
d. KEY REL
e. TEMP
f. GIMBAL LOCK
g. PROG
h. RESTART
i. TRACKER
j. OPR ERROR
k. COMP ACTY
l. VERB-NOUN Flashing
m. Plus 88888 in ROW 1, ROW 2 and ROW 3
} on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. +12345		ENTR
e. -67890	Do NOT press	ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

8. Perform the following DSKY operations:

a. VERB 57	NOUN 02	ENTR
b. 00015		ENTR
c. Observe VERB 21	NOUN 02	Flashing
d. 01600		ENTR
e. 33777		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 25	NOUN 26	Flashing
h. 04000		ENTR
i. 01600		ENTR
j. 00003		ENTR
k. VERB 30		ENTR

9. Verify that the RESTART condition lamp on the DSKY and CGC/LGC WARNING lamp on the monitor panel are lighted.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DATE _____

RUPT LOCK

11. Perform the following DSKY operations:

a. VERB 24	NOUN 02	ENTR
b. Observe VERB 24	NOUN 02	Flashing
c. 01600		ENTR
d. 30001		ENTR
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 25	NOUN 26	Flashing
h. 00001		ENTR
i. 01600		ENTR
j. 00003		ENTR
k. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and CGC/LGC WARNING lamp on the monitor panel are lighted.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

a. VERB 21	NOUN 02	ENTR
b. Observe VERB 21	NOUN 02	Flashing
c. 01600		ENTR
d. 04752		ENTR
e. VERB 25	NOUN 26	ENTR
f. 01600		ENTR
g. 00003		ENTR

15. Verify that the RESTART condition lamp on the DSKY and CGC/LGC WARNING lamp on the monitor panel are lighted.

16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

NIGHT WATCHMAN TEST

17. Perform the following DSKY operations:

a. VERB 24	NOUN 02	ENTR
b. Observe VERB 24	NOUN 02	Flashing
c. 01600		ENTR
d. 30001		ENTR
e. 01600		ENTR
f. VERB 25	NOUN 26	ENTR
g. Observe VERB 25	NOUN 26	Flashing
h. 03400		ENTR
i. 01600		ENTR
j. 00003		ENTR
k. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and CGC/LGC WARNING lamp on the monitor panel are lighted.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the

DATE _____

DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 34		ENTR
b. VERB 21	NOUN 27	ENTR
c. Observe VERB 21	NOUN 27	Flashing
d. 77777		ENTR

PIPA AND IRIG TEST (Nominal Voltage)

24. Perform the following DSKY operations:

a. VERB 57	ENTR
b. 00004	ENTR

25. In approximately 7 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

26. Enter VERB 33 and press ENTR pushbutton on the DSKY.

27. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

28. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

29. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

30. Repeat steps 23 through 27.

31. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

32. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

33. Repeat steps 23 through 27.

34. Enter VERB 34 and press the ENTR pushbutton on the DSKY.

35. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

36. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.84000	00000.84000
AC	00000.84000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

DATE _____

TDRR 27134 MAR 15 1966

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 2

JDC
NO. 12617
REV. -
INITIAL TDRR

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE ___ START ___ END ___ SITE / LOCATION
SER. NO. ___ DWG ___ REV. ___	TIME ___ START ___ END ___ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME ___ SER. NO. ___ CAL DATE

NAME ___ SER. NO. ___ CAL DATE

CONDUCTED BY ___ NAME/AFFILIATION APPROVED BY ___ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
25	gravity	cm/sec^2	975.0	R1 R2 _____ . _____	985.9		
27	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
29	IMU 28 vdc Bus	vdc	24.5		25.0		
30 (25)	gravity	cm/sec^2	975.0		985.9		
30 (27)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
32	IMU 28 vdc Bus	vdc	33.5		33.75		
33 (25)	gravity	cm/sec^2	975.0		985.9		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 2

JDC
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JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
33 (27)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DATE ___

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | INITIAL TDRR 25341 D.S. PGS 7

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3/16/66	27210	1-4	1-7	WK	TM

REFERENCES

IMPORTANT See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE

1. Establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply 0° ø A	199 PROBE TB5-37(hi) TPA #2 TB5-33(lo)
c.	800 cps 28V 5% supply 90° ø B	199 PROBE TB5-29(hi) TPA #2 TB5-33(lo)

SUBSYSTEM LEM G & N SYSTEM | ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D PULSE IN. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

SUBSYSTEM LEM G & N SYSTEM | ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ø A	199 PROBE TB5-37(hi) TPA #2 TB5-33(lo)	800 cps
b.	IMU 28V, 5% 800 cps ø B	199 PROBE TB5-29(hi) TPA #2 TB5-33(lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25)vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0)vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

SUBSYSTEM LEM G & N SYSTEM | ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. A
INITIAL TDRR 25 41

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CALIBRATE
NAME _____ SER. NO. _____ CALIBRATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
5.c **	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps	volts p-p	3				10		
19	Time difference	μsec	0				9.0		
20.a	IMU 28V 5% 800 cps ØB	deg							
20.b	IMU 28V 5% 800 cps ØA	deg	-100				-80		
21	Phase angle |ØA - ØB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.50				24.75		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 (5.b) **	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
22 (5.c) **	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps	volts p-p	3				10		
22 (19)	Time difference	μsec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ØB	deg							
22 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80		
22 (21)	Phase angle |ØA - ØB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 (5.b) **	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
23 (5.c) **	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps	volts p-p	3				10			
23 (19)	Time difference	μsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ØB	deg								
23 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80			
23 (21)	Phase angle | ØA - ØB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.20				0.4			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	0.80				1.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-16-66	27210	All	All	WK 2/3	ACM 2/3
B	3-16-66	27283	-	7	WK 1/3	ACM 1/3

REFERENCES

IMPORTANT

See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE

1. Establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply 0° ØA	199 PROBE TPA #2 TB5-37(hi) TB5-33(lo)
c.	800 cps 28V 5% supply 90° ØB	199 PROBE TPA #2 TB5-29(hi) TB5-33(lo)

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØA	199 PROBE TPA #2 TB5-37(hi) TB5-33(lo)	800 cps
b.	IMU 28V, 5% 800 cps ØB	199 PROBE TPA #2 TB5-29(hi) TB5-33(lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. B
INITIAL TDRR 2534

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
5.c **	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 101 9
Chg. 7 2

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps	volts p-p	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps ØB	deg							
20.b	IMU 28V 5% 800 cps ØA	deg	-100				-80		
21	Phase angle |ØA - ØB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.50				24.75		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
22 ** (5.c)	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps	volts p-p	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ØB	deg							
22 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80		
22 (21)	Phase angle |ØA - ØB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 126 8
REV. I

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
23 ** (5.c)	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps	volts p-p	3				10			
23 (19)	Time difference	µsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ØB	deg								
23 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80			
23 (21)	Phase angle |ØA - ØB|	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.20				0.5			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	0.80				1.6			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-16-66	27210	All	All	WK	ACM
B	3-16-66	27283	-	7	WK	ACM
C	4-26-66	28335	3	2,3,4,6,7	WK	-

REFERENCES

IMPORTANT See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE

1. Establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply 0° ø A	199 PROBE TPA #2 TB5-37(hi) TB5-33(lo)
c.	800 cps 28V 5% supply 90° ø B	199 PROBE TPA #2 TB5-29(hi) TB5-33(lo)

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ø B	199 PROBE TPA #2 TB5-29(hi) TB5-33(lo)	800 cps
b.	IMU 28V, 5% 800 cps ø A	199 PROBE TPA #2 TB5-37(hi) TB5-33(lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618 REV. C INITIAL TDRR 25341

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ___

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION _____

TIME _____ START _____ END _____ TOTAL ELAPSED _____

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE _____

NAME _____ SER. NO. _____ CAL DATE _____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
5.c **	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618 REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps **	volts p-p	3				10		
19	Time difference	μsec	0				9.0		
20.a	IMU 28V 5% 800 cps ØB	deg							
20.b	IMU 28V 5% 800 cps ØA	deg	-100				-80		
21	Phase angle |ØA - ØB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618 REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.00				24.25		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
22 ** (5.c)	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618 REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps **	volts p-p	3				10		
22 (19)	Time difference	μ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps Ø B	deg							
22 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80		
22 (21)	Phase angle |ØA - ØB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12618
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
23 ** (5.c)	800 cps 28V 5% supply 90° ØB	volts	25.9				30.1		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12618
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps **	volts p-p	3				10			
23 (19)	Time difference	μsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ØB	deg								
23 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80			
23 (21)	Phase angle |ØA - ØB|	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC
NO. 12618
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

INITIAL TDRR 25341 D.S. PGS 7

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	3-16-66	27210	All	All	WK	ACM	
B	3-16-66	27283	-	7	WK	ACM	
C	4-26-66	28335	3	2,3,4,6,7	WK	-	IMPORTANT
D	6-28-66	29849	1,3	1-6	MM	-	See Below:
							INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE

1. Establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply 0° ØB	199 PROBE TB5-37(hi) TPA #2 TB5-33(lo)
c.	800 cps 28V 5% supply 90° ØA	199 PROBE TB5-29(hi) TPA #2 TB5-33(lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØB	199 PROBE TB5-29(hi)	TPA #2 TB5-33(lo) 800 cps
b.	IMU 28V, 5% 800 cps ØA	199 PROBE TB5-37(hi)	TPA #2 TB5-33(lo) 800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. D
INITIAL TDRR 25311

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ (START) _____ (END) _____ (SITE / LOCATION)
TIME _____ (START) _____ (END) _____ (TOTAL ELAPSED)

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ (NAME/AFFILIATION) APPROVED BY _____ (NAME/AFFILIATION)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps **	volts p-p	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps øB	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-100				-80		
21	Phase angle |øA - øB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.00				24.25		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps **	volts p-p	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80		
22 (21)	Phase angle |øA - øB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps **	volts p-p	3				10			
23 (19)	Time difference	µsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80			
23 (21)	Phase angle | øA - øB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

INITIAL TDRR 25341 D.S. PGS. 7

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	3-16-66	27210	All	All	WK	ACM	
B	3-16-66	27283	-	7	WK	ACM	
C	4-26-66	28335	3	2,3,4,6,7	WK	-	IMPORTANT
D	6-28-66	29849	1,3	1-6	MM	-	See Below:
E	8-5-66	30533	1	-	EA	-	
							INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE

1. Establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply Ø B	199 PROBE TPA #2 TB5-29 (hi) TB5-33 (lo)
c.	800 cps 28V 5% supply Ø A	199 PROBE TPA #2 TB5-37 (hi) TB5-33 (lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
s.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps Ø B	199 PROBE TPA #2 TB5-29 (hi) TB5-33 (lo)	800 cps
b.	IMU 28V, 5% 800 cps Ø A	199 PROBE TPA #2 TB5-37 (hi) TB5-33 (lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV E
INITIAL TDRR 25311

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps **	volts p-p	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps øB	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-100				-80		
21	Phase angle |øA - øB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.00				24.25		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps **	volts p-p	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80		
22 (21)	Phase angle |øA - øB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps **	volts p-p	3				10			
23 (19)	Time difference	µsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80			
23 (21)	Phase angle | øA - øB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-16-66	27210	All	All	WK	ACM
B	3-16-66	27283	-	7	WK	ACM
C	4-26-66	28335	3	2,3,4,6,7	WK	-
D	6-28-66	29849	1,3	1-6	MM	-
E	8-5-66	30533	1	-	EA	-
F	2-2-67	32888	1,2	-	EA	-

REFERENCES

IMPORTANT

See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.
2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.
3. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.

NOMINAL BUS VOLTAGE

1. Perform JDC 12613 to establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply ØB	199 PROBE TPA #2 TB5-29 (hi) TB5-33 (lo)
c.	800 cps 28V 5% supply ØA	199 PROBE TPA #2 TB5-37 (hi) TB5-33 (lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (Pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

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13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps Ø B	199 PROBE TB5-29(hi)	TPA #2 TB5-33(lo) 800 cps
b.	IMU 28V, 5% 800 cps Ø A	199 PROBE TB5-37(hi)	TPA #2 TB5-33(lo) 800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

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30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	3-16-66	27210	All	All	WK	ACM	
B	3-16-66	27263	-	7	WK	ACM	
C	4-26-66	28335	3	2,3,4,6,7	WK	-	IMPORTANT
D	6-28-66	29849	1,3	1-6	MM	-	See Below:
E	8-5-66	30533	1	-	EA	-	
F	2-2-67	32888	1,2	-	EA	-	INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.
2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.
3. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.

NOMINAL BUS VOLTAGE

1. Perform JDC 12613 to establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply ØB	199 PROBE TPA #2 TB5-29 (hi) TB5-33 (lo)
c.	800 cps 28V 5% supply ØA	199 PROBE TPA #2 TB5-37(hi) TB5-33 (lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (Pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

DATE 18 JAN 66

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØB	199 PROBE TB5-29(hi) TPA #2 TB5-33(lo)	800 cps
b.	IMU 28V, 5% 800 cps ØA	199 PROBE TB5-37(hi) TPA #2 TB5-33(lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

DATE 18 JAN 66

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. F
INITIAL TDRR 25141

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 00149
Chg. 7-23-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps **	volts p-p	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps øB	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-100				-80		
21	Phase angle |øA - øB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.00				24.25		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps **	volts p-p	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80		
22 (21)	Phase angle |øA - øB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. F
INITIAL TDRR 25141

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FOR 10149
Ch. 7-13-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps **	volts p-p	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps ø B	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-100				-80		
21	Phase angle |øA - øB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.00				24.25		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps **	volts p-p	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80		
22 (21)	Phase angle |øA - øB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps **	volts p-p	3				10			
23 (19)	Time difference	μsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80			
23 (21)	Phase angle | øA - øB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps **	volts p-p	3				10			
23 (19)	Time difference	µsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps øB	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80			
23 (21)	Phase angle | øA - øB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

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JOB LEM G & N SYSTEM POWER SUPPLIES TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	3-16-66	27210	All	All	WK	ACM	
B	3-16-66	27283	-	7	WK	ACM	
C	4-26-66	28335	3	2,3,4,6,7	WK	-	IMPORTANT
D	6-28-66	29849	1,3	1-6	MM	-	See Below:
E	8-5-66	30533	1	-	EA	-	
F	2-2-67	32888	1,2	-	EA	-	INTERVAL
G	8-31-67	34458	2	2,4,6	EA		
							TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.
2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.
3. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.

NOMINAL BUS VOLTAGE

1. Perform JDC 12613 to establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply ØB	199 PROBE TPA #2 TB5-29 (hi) TB5-33 (lo)
c.	800 cps 28V 5% supply ØA	199 PROBE TPA #2 TB5-37 (hi) TB5-33 (lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (Pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the maximum positive pulse amplitude of the 3200 PPS computer synchronization pulses at TB1-6 (HI) and TB1-9 (LO) on TPA #2.

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FORM 00144
Chg. 7-23-65

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØB	199 PROBE TPA #2 TB5-29(hi) TB5-33(lo)	800 cps
b.	IMU 28V, 5% 800 cps ØA	199 PROBE TPA #2 TB5-37(hi) TB5-33(lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

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30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

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FORM 00144
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-16-66	27210	All	All	WK	ACM
B	3-16-66	27283	-	7	WK	ACM
C	4-26-66	28335	3	2,3,4,6,7	WK	-
D	6-28-66	29849	1,3	1-6	MM	-
E	8-5-66	30533	1	-	EA	-
F	2-2-67	32888	1,2	-	EA	-
G	8-31-67	34458	2	2,4,6	EA	
H	12-7-67	35213	1,3,4	-	EA	-

REFERENCES

IMPORTANT

See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.
2. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.
3. Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

NOMINAL BUS VOLTAGE

1. Perform JDC 12613 to establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply ØB	199 PROBE TPA #2 TB5-29 (hi) TB5-33 (lo)
c.	800 cps 28V 5% supply ØA	199 PROBE TPA #2 TB5-37 (hi) TB5-33 (lo)

SUBSYSTEM LEM G & N SYSTEM | ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (Pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the maximum positive pulse amplitude of the 3200 PPS computer synchronization pulses at TB1-6 (HI) and TB1-9 (LO) on TPA #2.

SUBSYSTEM LEM G & N SYSTEM | ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØB	199 PROBE TB5-29(hi)	TPA #2 TB5-33(lo) 800 cps
b.	IMU 28V, 5% 800 cps ØA	199 PROBE TB5-37(hi)	TPA #2 TB5-33(lo) 800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.50 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.50 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

SUBSYSTEM LEM G & N SYSTEM | ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

39. Calculate the LGC +14 VDC voltage change.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618 REV. H
INITIAL TDRR 253-1

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START END SYSTEM NO.
TIME START END
OPERATOR

JDC NO. 12618 REV. H

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps computer synchronization pulse **	volts	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps øB	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-100				-80		
21	Phase angle |øA - øB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START END SYSTEM NO.
TIME START END
OPERATOR

JDC NO. 12618 REV. H

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.00				24.25		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START END SYSTEM NO.
TIME START END
OPERATOR

JDC NO. 12618 REV. H

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps computer synchronization pulse **	volts	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80		
22 (21)	Phase angle |øA - øB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. H

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. H

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps computer synchronization pulse **	volts	3				10			
23 (19)	Time difference	µsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps øB	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80			
23 (21)	Phase angle | øA - øB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. H

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | JDC 12618 REV. J PAGE 1 OF 4
INITIAL TDRR 25341 D.S. PGS. 7

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-16-66	27210	All	All	WK	ACM
B	3-16-66	27283	-	7	WK	ACM
C	4-26-66	28335	3	2,3,4,6,7	WK	-
D	6-28-66	29849	1,3	1-6	MM	-
E	8-5-66	30533	1	-	EA	-
F	2-2-67	32888	1,2	-	EA	-
G	8-31-67	34458	2	2,4,6	EA	
H	12-7-67	35213	1,3,4	-	EA	-
J	2-6-68	35560	-	3,4	EA	-

REFERENCES

IMPORTANT See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.
2. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.
3. Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

NOMINAL BUS VOLTAGE

1. Perform JDC 12613 to establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply ØB	199 PROBE TB5-29 (hi) TPA #2 TB5-33 (lo)
c.	800 cps, 28V 5% supply ØA	199 PROBE TB5-37 (hi) TPA #2 TB5-33 (lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | JDC 12618 REV J PAGE 2 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (Pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse in. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the maximum positive pulse amplitude of the 3200 PPS computer synchronization pulses at TB1-6 (HI) and TB1-9 (LO) on TPA #2.

DATE 18 JAN 66

FORM 00144
Chg. 7-23-65

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | JDC 12618 REV J PAGE 3 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØB	199 PROBE TB5-29(hi)	TPA #2 TB5-33(lo) 800 cps
b.	IMU 28V, 5% 800 cps ØA	199 PROBE TB5-37(hi)	TPA #2 TB5-33(lo) 800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.50 (+0, -0.25) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.50 (+0.25, -0) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

DATE 18 JAN 66

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | JDC 12618 REV J PAGE 4 OF 4

SUBSYSTEM LEM G & N SYSTEM | ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. J
INITIAL TDRR 25311

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION _____
TIME _____ START _____ END _____ TOTAL ELAPSED _____

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL. DATE _____
NAME _____ SER. NO. _____ CAL. DATE _____

CONDUCTED BY _____ (NAME/AFFILIATION) APPROVED BY _____ (NAME/AFFILIATION)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.03				29.17		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps computer synchronization pulse **	volts	3				10		
19	Time difference	μsec	0				9.0		
20.a	IMU 28V 5% 800 cps øB	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-100				-80		
21	Phase angle |øA - øB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FORM 00150
Eng. 7-25-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.25				24.50		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 00150
Eng. 7-25-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO. _____
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps computer synchronization pulse **	volts	3				10		
22 (19)	Time difference	μ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps øB	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80		
22 (21)	Phase angle |øA - øB|	deg	100				80		
23 (4)	High Bus Voltage	volts	33.50				33.75		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FORM 00150
Eng. 7-25-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
28 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 0-156
Nov 9-3-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps computer synchronization pulse **	volts	3				10			
23 (19)	Time difference	μsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-100				-80			
23 (21)	Phase angle | øA - øB |	deg	100				80			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FORM 0-156
Nov 9-3-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 0-156
Nov 9-3-65

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | INITIAL TDRR 25341 D.S. PGS 7

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-16-66	27210	All	All	WK	ACM
B	3-16-66	27283	-	7	WK	ACM
C	4-26-66	28335	3	2,3,4,6,7	WK	-
D	6-28-66	29849	1,3	1-6	MM	-
E	8-5-66	30533	1	-	EA	-
F	2-2-67	32888	1,2	-	EA	-
G	8-31-67	34458	2	2,4,6	EA	
H	12-7-67	35213	1,3,4	-	EA	-
J	2-6-68	35560	-	3,4	EA	-
K	1-28-69	37274	1, 3	2-6	EA	-

REFERENCES: PS 6015000

IMPORTANT: See Below:

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.
2. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.
3. Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

NOMINAL BUS VOLTAGE

1. Perform JDC 12613 to establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply	199
		PROBE TPA #2
	ØB	TB5-29 (hi) TB5-33 (lo)
c.	800 cps 28V 5% supply	199
	ØA	PROBE TPA #2
		TB5-37 (hi) TB5-33 (lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM | ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (Pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	195
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	28 VDC LGC Operate	193
n.	800 cps Reference Voltage	281

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the maximum positive pulse amplitude of the 3200 PPS computer synchronization pulses at TB1-6 (HI) and TB1-9 (LO) on TPA #2.

DATE 18 JAN 66

FORM 0614
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM | ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5. Set MODE switch to ALTERNATE.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps	199	800 cps
	ØB	PROBE TB5-29(hi)	TPA #2 TB5-33(lo)
b.	IMU 28V, 5% 800 cps	199	800 cps
	ØA	PROBE TB5-37(hi)	TPA #2 TB5-33(lo)

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.50 (+0.25, -0) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 33.50 (+0, -0.25) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM | ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. K
INITIAL TDRR 25341

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b **	800 cps 28V 5% supply ø B	volts	25.9				30.1		
5.c **	800 cps 28V 5% supply ø A	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	28.04				29.16		
5.k	LGC +4 VDC	volts	3.8				4.2		
5.l	LGC +14.0 VDC	volts	13.6				14.4		
5.m	28 VDC LGC Operate	volts	24.5				33.5		
5.n	800 cps reference voltage	volts	27.44				28.56		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps computer synchronization pulse **	volts	3				10		
19	Time difference	µsec	0				9.0		
20.a	IMU 28V 5% 800 cps øB	deg	160				200		
20.b	IMU 28V 5% 800 cps øA	deg	-80				-100		
21	Phase angle |øA - øB|	deg	80				100		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.50				24.75		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
22 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
22 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	28.04				29.16		
22 (5.k)	LGC +4 VDC	volts	3.8				4.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START _____ END _____ SYSTEM NO.
TIME START _____ END _____
OPERATOR _____

JDC NO. 12618
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.6				14.4		
22 (5.m)	28 VDC LGC Operate	volts							
22 (5.n)	800 cps reference voltage	volts	26.60				29.40		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps computer synchronization pulse **	volts	3				10		
22 (19)	Time difference	µ sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200		
22 (20.b)	IMU 28V 5% 800 cps øA	deg	-80				-100		
22 (21)	Phase angle |øA - øB|	deg	80				100		
23 (4)	High Bus Voltage	volts	33.25				33.50		

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618 REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56		
23 ** (5.b)	800 cps 28V 5% supply ø B	volts	25.9				30.1		
23 ** (5.c)	800 cps 28V 5% supply ø A	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	28.04				29.16		
23 (5.k)	LGC +4 VDC	volts	3.8				4.2		
23 (5.l)	LGC +14.0 VDC	volts	13.6				14.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 00154
Nov 9-30-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618 REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
23 (5.m)	28 VDC LGC Operate	volts								
23 (5.n)	800 cps reference voltage	volts	26.60				29.40			
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125			
23 (9.b)	28V 3200 cps feedback	counts	099968				100032			
23 (10)	Counter indication	counts	099875				100125			
23 (12)	3200 pps computer synchronization pulse **	volts	3				10			
23 (19)	Time difference	µsec	0				9.0			
23 (20.a)	IMU 28V 5% 800 cps ø B	deg	160				200			
23 (20.b)	IMU 28V 5% 800 cps øA	deg	-80				-100			
23 (21)	Phase angle | øA - øB |	deg	80				100			
25	Nominal Bus Voltage	volts	27.75				28.25			
26	LGC +4 VDC	volts	3.85				4.15			(a)
30	BIAS 1 voltage	volts								(b)

* TO BE USED AS REQUIRED OR DESIRED
** Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FORM 00154
Nov 9-30-65

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO.
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618 REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.4				1.0			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	BIAS 2 voltage	volts								(d)
39	Line c - line d	volts	1.0				5.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 00154
Nov 9-30-65

JOB LEM G & N SYSTEM POWER SUPPLIES TEST | INITIAL TDRR 25341 DS. PGS 87

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
							IMPORTANT See Below:
							INTERVAL
							TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (**) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE

1. Establish a Master Initilization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

	VOLTAGE	CROSSBAR CONTROL
a.	800 cps 28V 1% supply	121
b.	800 cps 28V 5% supply 0° ØA	299 PROBE TPA #2 TB5-37(hi) TB5-33(lo)
c.	800 cps 28V 5% supply 90° ØB	299 PROBE TPA #2 TB5-29(hi) TB5-33(lo)

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

SUBSYSTEM LEM G & N SYSTEM | ASSY

	VOLTAGE	CROSSBAR CONTROL
d.	ECDU +4 VDC	118
e.	-28 VDC supply	124
f.	PTE (pulse Torque Electronics) supply 120 VDC output	259
g.	X PIPA PVR supply 28 VDC output	159
h.	Y PIPA PVR supply 28 VDC output	295
i.	Z PIPA PVR supply 28 VDC output	196
j.	3200 cps 28 V feedback (Suspension power)	123
k.	LGC +4 VDC	194
l.	LGC +14.0 VDC	293
m.	Regulated 28 VDC LGC Operate	193
n.	800 cps Reverence Voltage	

6. Set switches and controls on the Counter as follows:

DISPLAY TIME (N_2) switch to 10^5
DISPLAY RESET switch to ZERO
CLOCK FREQUENCY DIVIDER switch to 10
CLOCK SELECTOR to INTERNAL
INPUT SELECTOR switch to C SENSE
SENSE SELECTOR to FWD
ATTEN to 10
TRIGGER VOLTAGE fully ccw
SAMPLE TIME (N_1) to 008000
FUNCTION switch to RATIO OR PERIOD

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

8. Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N_1) setting on the Counter as indicated. Record each reading.

	Signal	"D" SIGNAL Selector	SAMPLE TIME (N_1) Setting
a.	IMU 28V 800 cps 1%	1	008000
b.	28V 3200 cps Feedback (Suspension power)	5	032000

10. Set the COUNTER INPUT A OR B SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER A or B. Change the Counter SAMPLE TIME (N_1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

DATE _____

SUBSYSTEM LEM G & N SYSTEM | ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec
TRIGGER - LOWER BEAM, INT
COUPLING - AC FAST
SLOPE - +
LEVEL - to see trace
B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50 μ sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated.

	SIGNAL	CROSSBAR CONTROL	REFERENCE VOLTAGE
a.	IMU 28V, 5% 800 cps ØA	299 PROBE TPA #2 TB5-37(hi) TB5-33(lo)	800 cps
b.	IMU 28V, 5% 800 cps ØB	299 PROBE TPA #2 TB5-29(hi) TB5-33(lo)	800 cps

21. Calculate phase angle between 20.a and 20.b.

LOW BUS VOLTAGE

22. Repeat steps 3 through 21 adjusting for 24.5 (+0.25, -0) vdc in step 4.

HIGH BUS VOLTAGE

23. Repeat steps 3 through 21 adjusting for 32.5 (+0 -0.25) vdc in step 4.

NORMALIZATION OF SYSTEM

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 171.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC +4VDC-CONTROL 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

DATE _____

SUBSYSTEM LEM G & N SYSTEM | ASSY

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-CONTROL 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12618
REV. -
INITIAL TDFR 25341

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
4	Nominal Bus Voltage	volts	27.75				28.25		
5.a	800 cps 28V 1%	volts	27.44				28.56		
5.b	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
5.c	800 cps 28V 5% supply 90° ØB	volts	26.6				29.4		
5.d	ECDU +4 VDC	volts	3.8				4.2		
5.e	-28 VDC	volts	-21.5				-33.5		
5.f	PTE supply 120 VDC	volts	114				126		
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		

* TO BE USED AS REQUIRED OR DESIRED

DATE

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 2 OF 7

TEST HISTORY
DATE START END SYSTEM NO.
TIME START END
OPERATOR

JDC NO. 12618
REV.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
5.j	3200 cps 28V feedback	volts	27.44				28.56		
5.k	LGC +4 VDC	volts	3.85				4.15		
5.l	LGC +14.0 VDC	volts	13.8				14.2		
5.m	Regulated 28 VDC LGC Operate	volts	26.8				28.2		
5.n	800 cps reference voltage	volts	26.60				29.40		
9.a	IMU 28V 800 cps 1%	counts	099875				100125		
9.b	28V 3200 cps feedback	counts	099968				100032		
10	Counter indication	counts	099875				100125		
12	3200 pps	volts p-p	3				10		
19	Time difference	sec	0				9.0		
20.a	IMU 28V 5% 800 cps ØB	deg							
20.b	IMU 28V 5% 800 cps ØA	deg	-100				-80		
21	Phase angle |ØA - ØB|	deg	100				80		

* TO BE USED AS REQUIRED OR DESIRED

DATE

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF 7

TEST HISTORY
DATE START END SYSTEM NO.
TIME START END
OPERATOR

JDC NO. 12618
REV. -

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (4)	Low Bus Voltage	volts	24.25				23.75		
22 (5.a)	800 cps 28V 1%	volts	27.44				28.25		
22 (5.b)	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
22 (5.c)	800 cps 28V 5% supply 90° ØB	volts	26.6				29.4		
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
22 (5.e)	-28 VDC	volts	-21.5				-33.5		
22 (5.f)	PTE supply 120 VDC	volts	114				126		
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
22 (5.j)	3200 cps 28V feedback	volts	27.44				28.56		
22 (5.k)	LGC +4 VDC	volts	3.85				4.15		

* TO BE USED AS REQUIRED OR DESIRED

DATE

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF 7

TEST HISTORY
DATE START END SYSTEM NO.
TIME START END
OPERATOR

JDC NO. 12618
REV.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		
22 (5.m)	Regulated 28 VDC LGC operate	volts	27.8				28.2		
22 (5.n)	800 cps reference voltage	volts	27.44				28.56		
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
22 (9.b)	28V 3200 cps feedback	counts	099968				100032		
22 (10)	Counter indication	counts	099875				100125		
22 (12)	3200 pps	volts p-p	3				10		
22 (19)	Time difference	sec	0				9.0		
22 (20.a)	IMU 28V 5% 800 cps ØB	deg							
22 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80		
22 (21)	Phase angle |ØA - ØB|	deg	100				80		
23 (4)	High Bus Voltage	volts	32.25				32.75		

* TO BE USED AS REQUIRED OR DESIRED

DATE

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. -

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.a)	800 cps 28V 1%	volts	27.44				28.25		
23 (5.b)	800 cps 28V 5% supply 0° ØA	volts	25.2				30.8		
23 (5.c)	800 cps 28V 5% supply 90° ØB	volts	26.6				29.4		
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2		
23 (5.e)	-28 VDC	volts	-21.5				-33.5		
23 (5.f)	PTE supply 120 VDC	volts	114				126		
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4		
23 (5.j)	3200 cps 28V feedback	volts	27.44				28.56		
23 (5.k)	LGC +4 VDC	volts	3.85				4.15		
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2		

* TO BE USED AS REQUIRED OR DESIRED

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. -

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC
23 (5.m)	Regulated 28 VDC LGC operate	volts	27.8				28.2		
23 (5.n)	800 cps reference voltage	volts	27.44				28.56		
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125		
23 (9.b)	28V 3200 cps feedback	counts	099968				100032		
23 (10)	Counter indication	counts	099875				100125		
23 (12)	3200 pps	volts p-p	3				10		
23 (19)	Time difference	sec	0				9.0		
23 (20.a)	IMU 28V 5% 800 cps ØB	deg							
23 (20.b)	IMU 28V 5% 800 cps ØA	deg	-100				-80		
23 (21)	Phase angle | ØA - ØB |	deg	100				80		
25	Nominal Bus Voltage	volts	27.75				28.25		
26	LGC +4 VDC	volts	3.85				4.15		
30	CONTROL 1 voltage	volts							

* TO BE USED AS REQUIRED OR DESIRED

DATE ____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12618
REV. -

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES 1st	2nd*	3rd*	MAX VALUE	REJ	ACC	
32	Line a - line b	volts	0.20				0.4			
33	LGC +14 VDC	volts	13.8				14.2			(c)
37	CONTROL 2 voltage	volts								(d)
39	Line c - line d	volts	0.80				1.0			

* TO BE USED AS REQUIRED OR DESIRED

DATE ____

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal character stics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 20 Displayed
i. VERB 36 ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the DVM. Record the indication of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

9. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
A1P	J2F (OG-Δθ Abort)	SCOPE A IN
TPA#2	DIRECT PROBE	TB1 -45 (hi) 49 (lo)
TPA#2	BUFFERED PROBE	TB2 -35 (hi) 18 (lo)

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 1)
b. IRIG PVR (PIPA & IRIG SF Selector switch, position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF Selector switch, position 11) on the Current Source Monitor, JDC 18016
e. IRIG Scale Factor (PIPA & IRIG SF Selector switch, position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 40000 ENTR
m. VERB 22 NOUN 01 Flashing
n. 40077 ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

22. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 21 ENTR
j. 00465 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

33. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 1.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing

c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 1.

42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 1.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 42	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 54000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ abort signal on the scope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 1.

60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 23	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the phase sensitivie Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.

IG STEP RESPONSE

67. Connect a jumper between:

TPA #2	TB 5-27 and
TPA #2	TB 2-11

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 20	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	50 MV/MM
c.	3	10 MV/MM

75. Remove the jumper of step 67 and connect as follows:

TPA #2	TP 5-18 and
TPA #2	TB 2-10

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 42	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

TPA #2	TB 5-18 and
TPA #2	TB 2.4

83. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 20	Displayed
i.	VERB 36		ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

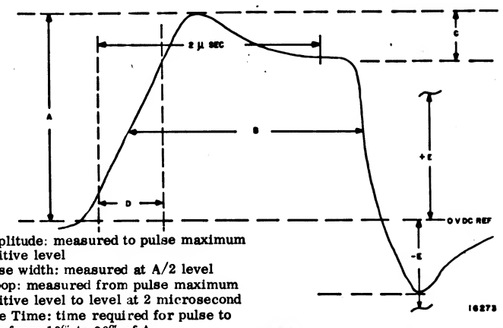
NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

a.	VERB 36	ENTR

89. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 23	Flashing
g.	+00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 1. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12619 REV. A INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal**	mv			60		
6.b	MG Error signal**	mv			60		
6.c	IG Error signal**	mv			60		
6.d	X Gyro Error signal**	mv			60		
6.e	Z Gyro Error signal**	mv			60		
7.a	OG TDA	vdc			20 p-p		
7.b	MG TDA	vdc			20 p-p		
7.c	IG TDA	vdc			20 p-p		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μ sec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μ sec			0.5		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619 REV. A

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.09		1.21		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG + Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μ sec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μ sec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μ sec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μ sec			0.5		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619
REV. A

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG + Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			$\frac{A}{5}$		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			$\frac{A}{5}$		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12619
REV. A

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			$\frac{A}{5}$		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	IG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
80	MG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
87	OG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified					

DATE 15 MAR 66

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus $\Delta\theta$ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MB

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 20	Displayed
i. VERB 36		ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the DVM. Record the indication of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

9. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
A1P	J2F (OG-$\Delta\theta$ Abort)	SCOPE A IN
TPA#2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 1)
b. IRIG PVR (PIPA & IRIG SF Selector switch, position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF Selector switch, position 11) on the Current Source Monitor, JDC 18016
e. IRIG Scale Factor (PIPA & IRIG SF Selector switch, position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +$\Delta\theta$ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

22. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 21	ENTR
j. 00465		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -$\Delta\theta$ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 1.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 1.

42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 1.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 42	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 54000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ abort signal on the scope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 1.

60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 23	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the phase sensitivie Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.

IG STEP RESPONSE

67. Connect a jumper between:

TPA #2	TB 5-27 and
TPA #2	TB 2-11

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 20	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	50 MV/MM
c.	3	10 MV/MM

75. Remove the jumper of step 67 and connect as follows:

TPA #2	TP 5-18 and
TPA #2	TB 2-10

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 42	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

TPA #2	TB 5-18 and
TPA #2	TB 2.4

83. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe VERB 41	NOUN 20	Displayed
i.	VERB 36		ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

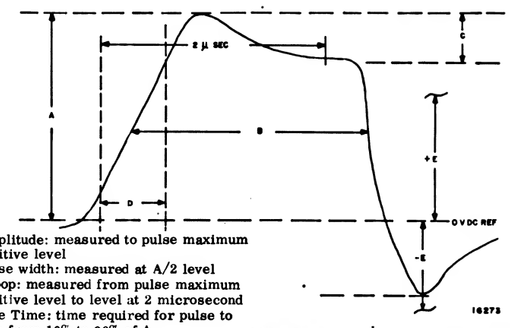
NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

a.	VERB 36	ENTR

89. Perform the following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe VERB 23	NOUN 23	Flashing
g.	+00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 1. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12619 REV. B INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal**	mv			60		
6.b	MG Error signal**	mv			60		
6.c	IG Error signal**	mv			60		
6.d	X Gyro Error signal**	mv			60		
6.e	Z Gyro Error signal**	mv			60		
7.a	OG TDA	vdc			20 p-p		
7.b	MG TDA	vdc			20 p-p		
7.c	IG TDA	vdc			20 p-p		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μ sec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μ sec			0.5		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619 REV. B

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG +Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μ sec	2		4		
23.C	Droop.	volts			A/5		
23.D	Rise Time	μ sec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μ sec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μ sec			0.5		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619
REV. B

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG + Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12619
REV. B

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	IG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
80	MG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
87	OG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified					

DATE 15 MAR 66

JOB GIMBAL RESPONSE TEST

INITIAL TDRR 27134 D.S. PGS 4

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus $\Delta\theta$ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MMF	ACM
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

JOB GIMBAL RESPONSE TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY

f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 20 Displayed
i. VERB 36 ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

	Voltage	CROSSBAR CONTROL
a.	OG Error Signal	133
b.	MG Error Signal	134
c.	IG Error Signal	135
d.	X Gyro Error Signal	233
e.	Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the oscilloscope. Record the peak-to-peak indications of each:

	Voltage	CROSSBAR CONTROL
a.	OG TDA	136
b.	MG TDA	137
c.	IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

9. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
A1P	J2F (OG-$\Delta\theta$ Abort)	SCOPE A IN
TPA#2	DIRECT PROBE	TB1 -45 (hi) 49 (lo)
TPA#2	BUFFERED PROBE	TB2 -35 (hi) 18 (lo)

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

JOB GIMBAL RESPONSE TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 1)
b. IRIG PVR (PIPA & IRIG SF Selector switch, position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF Selector switch, position 11) on the Current Source Monitor, JDC 18016
e. IRIG Scale Factor (PIPA & IRIG SF Selector switch, position 12) on the Current Source Monitor per JDC18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 40000 ENTR
m. VERB 22 NOUN 01 Flashing
n. 40077 ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +$\Delta\theta$ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

22. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

JOB GIMBAL RESPONSE TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY

23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -$\Delta\theta$ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

33. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 1.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing

c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 1.

42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 1.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the scope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 1.

60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the phase sensitivie Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.

IG STEP RESPONSE

67. Connect a jumper between:

TPA #2	TB 5-27 and
TPA #2	TB 2-11

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	50 MV/MM
c.	3	10 MV/MM

75. Remove the jumper of step 67 and connect as follows:

TPA #2	TP 5-18 and
TPA #2	TB 2-10

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR

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f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

9. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
A1P	J2F (OG-Δθ Abort)	SCOPE A IN
TPA#2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 1)
b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 40000 ENTR
m. VERB 22 NOUN 01 Flashing
n. 40077 ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

22. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

33. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 1.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MI	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

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f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

9. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
A1P	J2F (OG-Δθ Abort)	SCOPE A IN
TPA#2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

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b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 1)
b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

22. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

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23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 1.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing

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c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM

c. CHANNEL 5 to 50 MV/MM.

39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 1.

42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM

c. CHANNEL 5 to 50 MV/MM

50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 1.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the scope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM

c. CHANNEL 5 to 50 MV/MM.

57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 1.

60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the phase sensitivie Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.

IG STEP RESPONSE

67. Connect a jumper between:

TPA #2	TB 5-27 and
TPA #2	TB 2-11

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	50 MV/MM
c.	3	10 MV/MM

75. Remove the jumper of step 67 and connect as follows:

TPA #2	TP 5-18 and
TPA #2	TB 2-10

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM

c. CHANNEL 5 to 50 MV/MM.

39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 1.

42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM

c. CHANNEL 5 to 50 MV/MM

50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 1.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the scope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 10 MV/MM

c. CHANNEL 5 to 50 MV/MM.

57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 1.

60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the phase sensitivie Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.

IG STEP RESPONSE

67. Connect a jumper between:

TPA #2	TB 5-27 and
TPA #2	TB 2-11

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	50 MV/MM
c.	3	10 MV/MM

75. Remove the jumper of step 67 and connect as follows:

TPA #2	TP 5-18 and
TPA #2	TB 2-10

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

TPA #2	TB 5-18 and
TPA #2	TB 2.4

83. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

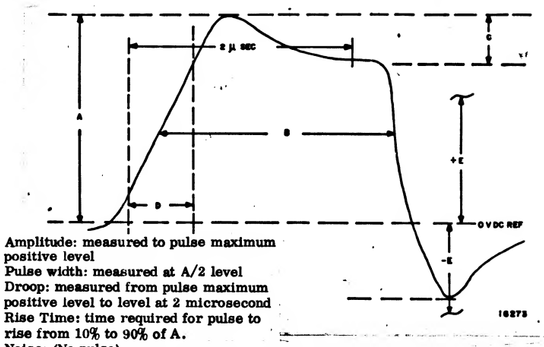
NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

a. VERB 36	ENTR

89. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 1. Waveform Description

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EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12619 JDC
REV. F
INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG +Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μ sec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μ sec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μ sec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μ sec			0.5		

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OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

TPA #2	TB 5-18 and
TPA #2	TB 2.4

83. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

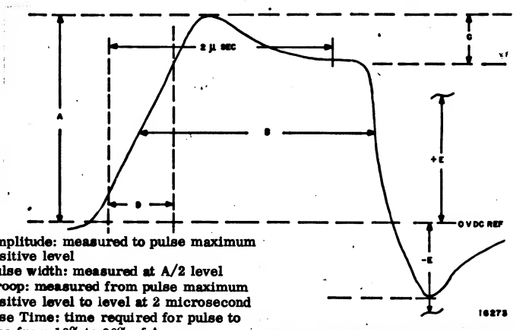
NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

a. VERB 36		ENTR

89. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 1. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12619 REV. F INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619 REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG +Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μsec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μsec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μsec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG + Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

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JDC NO. 12619
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JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	IG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
80	MG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
87	OG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified					

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG +Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			$\frac{A}{5}$		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			$\frac{A}{5}$		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12619
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			$\frac{A}{5}$		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	IG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
80	MG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
87	OG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified					

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FORM 0014
Chg. 7-23-65

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

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f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

5. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

9. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA #2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA #2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)
TPA #2	PULSE PROBE	TB1-6 (Blu) TB1-9 (Blk)

10. Deleted.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

14. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

15. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 3)
b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

21. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

22. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

23. Measure and record the oscilloscope indication of A through E as represented on figure 3.

24. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

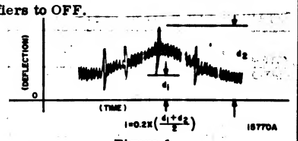

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, d_2 is the deflection in centimeters measured from zero reference to the maximum peak deflection, and d_1 is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-

REFERENCES PS 6015000

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

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f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

5. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

9. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA #2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA #2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)
TPA #2	PULSE PROBE	TB1-6 (Blu) TB1-9 (Blk)

10. Deleted.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3

b. OG TM current on CHANNEL 4

c. OG CDU Coarse Error on CHANNEL 5.

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12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

14. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

15. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 3)

b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016

c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016

d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

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b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

21. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

22. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

23. Measure and record the oscilloscope indication of A through E as represented on figure 3.

24. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

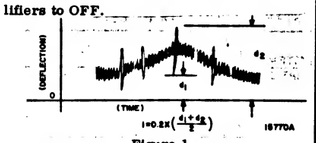

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, d_2 is the deflection in centimeters measured from zero reference to the maximum peak deflection, and d_1 is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1

b. IG TM Current on CHANNEL 4

c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 3.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 3.

42. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR

f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 3.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR

m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 3.

60. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM

c. 3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.

IG STEP RESPONSE

67. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

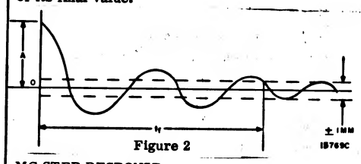


Figure 2

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

75. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 67 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 3.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 3.

42. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR

f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 3.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR

m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 3.

60. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM

c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.

IG STEP RESPONSE

67. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

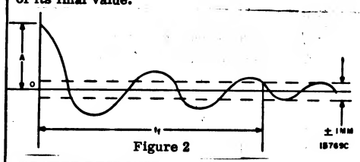


Figure 2

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

75. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 67 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing

g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

77. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

82. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 75 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

83. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

84. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

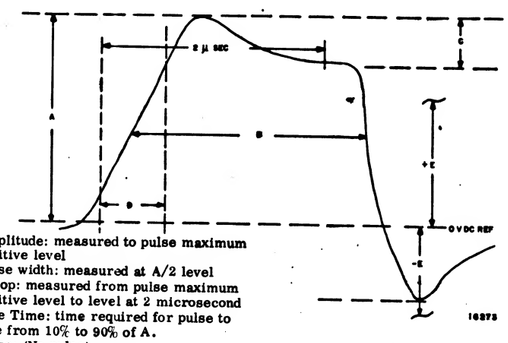
87. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:
a. VERB 36 ENTR

89. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12619 REV. H INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619 REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG +Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μsec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μsec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μsec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μsec			0.5		

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g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

77. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

82. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 75 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

83. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

84. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

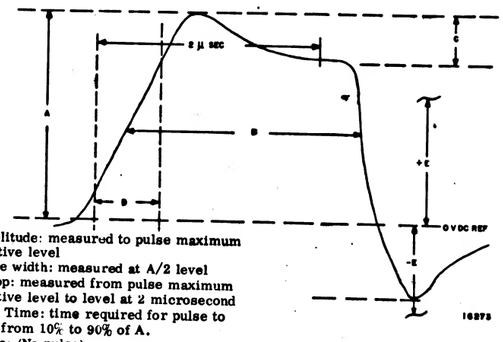
87. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:
a. VERB 36 ENTR

89. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing

c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12619 REV. H INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
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JDC NO. 12619 REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG +Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μsec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μsec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μsec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG +Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			$\frac{A}{5}$		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			$\frac{A}{5}$		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

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EQUIPMENT TEST
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JDC NO. 12619
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			$\frac{A}{5}$		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
80	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
87	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

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EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619 REV. B

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG + Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12619 REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
80	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
87	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

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DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MMEA	ACM
B	7-21-66	30273	-	2	EA	MBM
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
I	11-30-67	35183	1-4, 6-9	All	EA	-

REFERENCES PS 6015000

IMPORTANT INTERVAL Insure that connector assembly (2003099) is connected to the LGC test connector.

TOOLS AND MATERIAL

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

5. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

9. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA #2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA #2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)
TPA #2	PULSE PROBE	TB1-6 (Blu) TB1-9 (Blk)

10. Deleted.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

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12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

14. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

15. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 3)

NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.

b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

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19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

21. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

22. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

23. Measure and record the oscilloscope indication of A through E as represented on figure 3.

24. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

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26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 3.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 3.

42. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 3.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 3.

60. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.

IG STEP RESPONSE

67. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

69. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

70. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

71. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

72. Deleted.

73. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

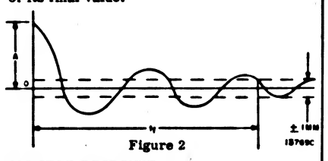


Figure 2

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

75. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 67 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

78. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

79. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to off.

80. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

82. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 75 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

83. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

84. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

85. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

86. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

87. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

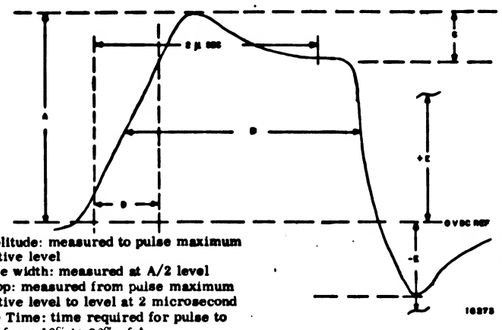
NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

a. VERB 36		ENTR

89. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

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EQUIPMENT TEST
DATA SHEET 1 OF 4

NO. 12619 JDC
REV. J
INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - Δθ abort	Refer to fig 3					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619 REV J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc					
16.c	IRIG Torque Current Monitor	vdc					
16.d	IRIG SF voltage	vdc					
23	OG + Δθ abort	Refer to fig 3					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μ sec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μ sec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	amps	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 3					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μ sec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μ sec			0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619 REV J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG + Δθ abort	Refer to fig 3					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	amps	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 3					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 3					

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EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12619 REV J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	amps	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
80	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
87	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

DATE 15 MAR 66

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MMA	ACM
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
J	11-30-67	35183	1-4, 6-9	All	EA	-
K	1-25-68	35482	2-10	All	EA	-

REFERENCES PS 6015000

IMPORTANT Insure that connector assembly (2003099) is connected to the LGC test connector.

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

5. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR

STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set Gimbal Servo Test selector on Test Selector panel to 1.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

20. Set PAVM to the phase angle value recorded in step 19.

21. Read and record the voltage indicated on PAVM as the IG error in-phase null.

22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.

23. Read and record the voltage indicated on PAVM as the MG error in-phase null.

24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.

25. Read and record the voltage indicated on PAVM as the OG error in-phase null.

26. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

27. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

28. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-ΔθAbort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA #2	DIRECT PROBE	TB1-45 (hi) 49 (lc)
TPA #2	BUFFERED PROBE	TB2-35 (hi) 18 (lc)
TPA #2	PULSE PROBE	TB1-6 (Blu) TB1-9 (Blk)

29. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3

b. OG TM current on CHANNEL 4

c. OG CDU Coarse Error on CHANNEL 5.

30. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 34 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 27 and 33 and complete measurements not taken.

34. Measure and record the following signals:

a. Scope indications A through E (figure 3)

NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.

b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016

c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016

d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

35. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

44. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

45. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

46. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

47. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1

b. IG TM Current on CHANNEL 4

c. IG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

61. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

62. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

63. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

64. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

65. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2

b. MG TM Current on CHANNEL 4

c. MG CDU Coarse Error on CHANNEL 5.

66. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

67. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM

68. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.

69. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 70 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 61 and 69 and complete measurements not taken.

70. Measure and record the oscilloscope indication of A through E as represented on figure 3.

71. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

72. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

73. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.

74. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

75. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 72 and 76 and complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in figure 3.

78. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

79. Remove all jumper cables placed during this procedure.

80. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

81. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

82. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

83. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

84. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.

IG STEP RESPONSE

85. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

86. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

87. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

88. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

89. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

90. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

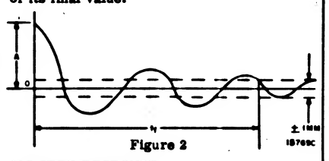


Figure 2

MG STEP RESPONSE

91. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

92. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 85 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

93. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

95. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to off.

97. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

98. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

99. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 92 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

100. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

102. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

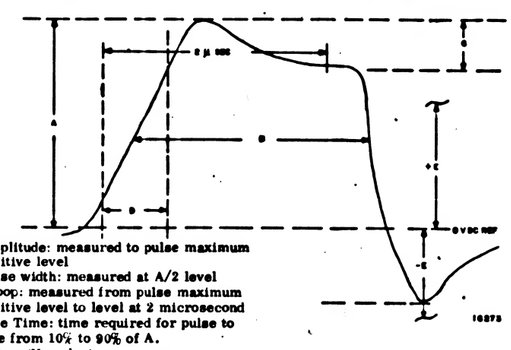
NORMALIZATION OF SYSTEM

105. Perform the following DSKY operation:

a. VERB 36		ENTR

106. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

JDC NO. 12619 REV K INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
9	PHASE GENERATOR 3200 CPS readout	deg					
15	PHASE GENERATOR 3200 CPS readout	deg					
17	PHASE GENERATOR 3200 CPS readout	deg					
19	IG error phase shift	deg					
21	IG error in-phase null	mv	-60		+60		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12619 REV K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22(15)	PHASE GENERATOR 3200 CPS readout	deg					
22(17)	PHASE GENERATOR 3200 CPS readout	deg					
22(19)	MG error phase shift	deg					
22(21)	MG error in-phase null	mv	-60		+60		
24(15)	PHASE GENERATOR 3200 CPS readout	deg					
24(17)	PHASE GENERATOR 3200 CPS readout	deg					
24(19)	OG error phase shift	deg					
24(21)	OG error in-phase null	mv	-60		+60		
26.a	Total OG TDA	volts			10		
26.b	Total MG TDA	volts			10		
26.c	Total IG TDA	volts			10		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12619 REV K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	OG - Δθ abort	Refer to fig 3					
34.a.A	Amplitude	peak volts	4		10		
34.a.B	Pulse width	μsec	2		4		
34.a.C	Droop	volts			A/5		
34.a.D	Rise Time	μsec			0.5		
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
34.b	IRIG PVR	vdc					
34.c	IRIG Torque Current Monitor	vdc					
34.d	IRIG SF voltage	vdc					
41	OG + Δθ abort	Refer to fig 3					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μ sec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12619 REV K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
42	OG TM Current CH4	amps	-0.125		+0.125		
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	IG - Δθ abort	Refer to fig 3					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μ sec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	IG + Δθ abort	Refer to fig 3					
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μ sec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12619
REV K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
60	IG TM Current on CH4	amps	-0.125		+0.125		
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
70	MG - Δθ abort	Refer to fig 3					
70.A	Amplitude	peak volts	4		10		
70.B	Pulse width	μ sec	2		4		
70.C	Droop	volts			A/5		
70.D	Rise Time	μ sec			0.5		
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
77	MG + Δθ abort	Refer to fig 3					
77.A	Amplitude	peak volts	4		10		
77.B	Pulse width	μ sec	2		4		
77.C	Droop	volts			A/5		
77.D	Rise Time	μ sec			0.5		
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12619
REV K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
78	MG TM Current on CH4	amps	-0.125		+0.125		
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
90	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
97	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
104	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

DATE 15 MAR 66

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MA	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MMC	ACN
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
J	11-30-67	35183	1-4, 6-9	All	EA	-
K	1-25-68	35482	2-10	All	EA	-
L	3-28-68	35978	4-11	2	EA	-

REFERENCES PS 6015000

IMPORTANT Insure that connector assembly (2003099) is connected to the LGC test connector.

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

5. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR

STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set Gimbal Servo Test selector on Test Selector panel to 1.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

20. Set PAVM to the phase angle value recorded in step 19.

21. Read and record the voltage indicated on PAVM as the IG error in-phase null.

22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.

23. Read and record the voltage indicated on PAVM as the MG error in-phase null.

24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.

25. Read and record the voltage indicated on PAVM as the OG error in-phase null.

26. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

	Voltage	CROSSBAR CONTROL
a. OG TDA		136
b. MG TDA		137
c. IG TDA		138

-OG FRICTION

27. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

28. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA #2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA #2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)
TPA #2	PULSE PROBE	TB1-6 (Blu) TB1-9 (Blk)

29. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3

b. OG TM current on CHANNEL 4

c. OG CDU Coarse Error on CHANNEL 5.

30. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

31. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 34 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 27 and 33 and complete measurements not taken.

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

c. CHANNEL 5 to 50 MV/MM.

34. Measure and record the following signals:

a. Scope indications A through E (figure 3)

NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.

b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016

c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016

d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

35. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000	-	ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ abort signal on the oscilloscope.

38. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

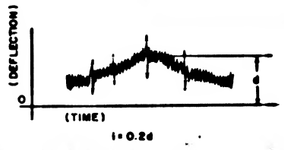


Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

44. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

45. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

46. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

47. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ abort signal on the oscilloscope.

56. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

61. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

62. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

63. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

64. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

65. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

66. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

67. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

68. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

69. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

NOTE: Perform step 70 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 61 and 69 and complete measurements not taken.

70. Measure and record the oscilloscope indication of A through E as represented on figure 3.

71. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

72. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

73. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ abort signal on the Oscilloscope.

74. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

75. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 72 and 76 and complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in figure 3.

78. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

79. Remove all jumper cables placed during this procedure.

80. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

81. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

82. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

83. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

84. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

IG STEP RESPONSE

85. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

86. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.

87. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

88. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

89. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

90. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

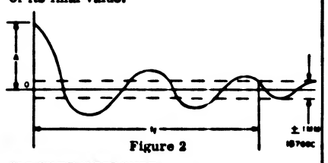


Figure 2

MG STEP RESPONSE

91. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

92. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 85 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

93. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

95. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to off.

97. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

98. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing

c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

99. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 92 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

100. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

102. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

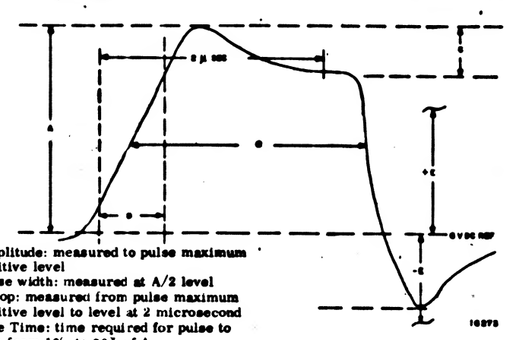
NORMALIZATION OF SYSTEM

105. Perform the following DSKY operation:

a. VERB 36		ENTR

106. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

NO. 12619 JDC
REV L
INITIAL TDRR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME / AFFILIATION APPROVED BY _____ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
9	PHASE GENERATOR 3200 CPS readout	deg					
15	PHASE GENERATOR 3200 CPS readout	deg					
17	PHASE GENERATOR 3200 CPS readout	deg					
19	IG error phase shift	deg					
21	IG error in-phase null	mv	-60		+60		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12619
REV L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22(15)	PHASE GENERATOR 3200 CPS readout	deg					
22(17)	PHASE GENERATOR 3200 CPS readout	deg					
22(19)	MG error phase shift	deg					
23	MG error in-phase null	mv	-60		+60		
24(15)	PHASE GENERATOR 3200 CPS readout	deg					
24(17)	PHASE GENERATOR 3200 CPS readout	deg					
24(19)	OG error phase shift	deg					
25	OG error in-phase null	mv	-60		+60		
26.a	Total OG TDA	volts			10		
26.b	Total MG TDA	volts			10		
26.c	Total IG TDA	volts			10		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12619
REV L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	OG - Δθ abort	Refer to fig 3					
34.a.A	Amplitude	peak volts	4		10		
34.a.B	Pulse width	μsec	2		4		
34.a.C	Droop	volts			A/5		
34.a.D	Rise Time	μsec			0.5		
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
34.b	IRIG PVR	vdc					
34.c	IRIG Torque Current Monitor	vdc					
34.d	IRIG SF voltage	vdc					
41	OG + Δθ abort	Refer to fig 3					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μsec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12619
REV L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
42	OG TM Current CH4	amps	-0.125		+0.125		
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	IG - Δθ abort	Refer to fig 3					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μ sec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	IG + Δθ abort	Refer to fig 3					
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μ sec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12619
REV. L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
60	IG TM Current on CH4	amps	-0.125		+0.125		
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
70	MG - Δθ abort	Refer to fig 3					
70.A	Amplitude	peak volts	4		10		
70.B	Pulse width	μ sec	2		4		
70.C	Droop	volts			A/5		
70.D	Rise Time	μ sec			0.5		
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
77	MG + Δθ abort	Refer to fig 3					
77.A	Amplitude	peak volts	4		10		
77.B	Pulse width	μ sec	2		4		
77.C	Droop	volts			A/5		
77.D	Rise Time	μ sec			0.5		
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12619
REV. L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
78	MG TM Current on CH4	amps	-0.125		+0.125		
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
90	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
97	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
104	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

DATE 15 MAR 66

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MBH
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	2-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
J	11-30-67	35183	1-4,6-9	All	EA	-
K	1-25-68	35482	2-10	All	EA	-
L	3-28-68	35978	4-11	2	EA	-
M	6-9-68	36046	2-4,7-9	-	EA	-

REFERENCES PS 6015000

IMPORTANT Insure that connector assembly (2003099) is connected to the LGC test connector.

INTERVAL

TOOLS AND MATERIAL

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR

f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

5. Perform the following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR

STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set Gimbal Servo Test selector on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

17A. Set CHANNEL 1 selector on Oscillograph Signal Selector panel to 2 to monitor the IG Error signal on the Oscillograph.

17B. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for CHANNEL 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

17C. Adjust PHASE ADJUST screw on CHANNEL 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of CHANNEL 1 pen.

17D. Set SENSITIVITY control for CHANNEL 1 to OFF.

17E. Set CHANNEL 1 selector on Oscillograph Signal Selector panel to OFF.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

19A. Connect IG Error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

20. Set PAVM to the phase angle value recorded in step 19.

21. Read and record the voltage indicated on PAVM as the IG error in-phase null.

22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134, and Oscillograph Signal Selector panel CHANNEL 2 position 2.

23. Read and record the voltage indicated on PAVM as the MG error in-phase null.

24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133, and Oscillograph Signal Selector panel CHANNEL 3 position 2.

25. Read and record the voltage indicated on PAVM as the OG error in-phase null.

26. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

	Voltage	CROSSBAR CONTROL
a. OG TDA		136
b. MG TDA		137
c. IG TDA		138

OG FRICTION

27. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

28. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)

TPA #8	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA #2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)
TPA #2	PULSE PROBE	TB1-6 (Blu) TB1-9 (Blk)

29. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to 15 and monitor the following signals:
a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

30. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

31. Perform the following DSKY operations:
VERB 42 ENTR
VERB 33 ENTR

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Set the sensitivities on the Oscillograph Amplifier as follows:
a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: If the measurements in step 34 cannot be completed before pulse torquing ends, perform step 35, repeat steps 27 and 31, and then complete measurements not taken.

34. Measure and record the following signals:
a. Scope indications A through E (figure 3)
NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.
b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

35. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000	-	ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

38. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

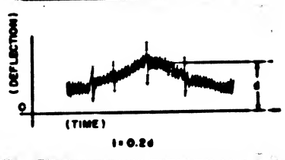


Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing

e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

44. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

45. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

46. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

47. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

56. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

61. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

62. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

63. Remove the jumper from TB 2-31 and place it on TB 2-22 of TPA #2.

64. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

65. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

66. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

67. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

68. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

69. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

NOTE: Perform step 70 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends, perform step 71, repeat steps 61 and 67, and then complete measurements not taken.

70. Measure and record the oscilloscope indication of A through E as represented on figure 3.

71. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

72. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

73. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.

74. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

75. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends, perform step 78, repeat steps 72 and 74, and then complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in figure 3.

78. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using

the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

79. Remove all jumper cables placed during this procedure.

80. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

81. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

82. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

83. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

84. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to VARIABLE. Set FILTER switches to HI.

IG STEP RESPONSE

85. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

86. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

87. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

88. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

89. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

90. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

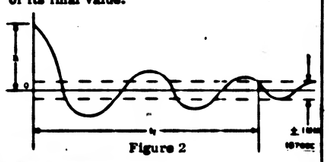


Figure 2

MG STEP RESPONSE

91. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

92. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 85 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

93. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

95. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to off.

97. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

98. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

99. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 92 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

100. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

102. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

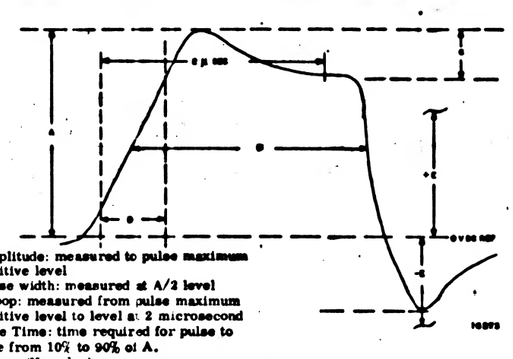
NORMALIZATION OF SYSTEM

105. Perform the following DSKY operation:

a. VERB 36 ENTR

106. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

JDC NO. 12619 REV M
INITIAL TDRR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME / AFFILIATION APPROVED BY _____ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
9	PHASE GENERATOR 3200 CPS readout	deg					
15	PHASE GENERATOR 3200 CPS readout	deg					
17	PHASE GENERATOR 3200 CPS readout	deg					
19	IG error phase shift	deg					
21	IG error in-phase null	mv	-60		+60		

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EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12619 REV M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22(15)	PHASE GENERATOR 3200 CPS readout	deg					
22(17)	PHASE GENERATOR 3200 CPS readout	deg					
22(19)	MG error phase shift	deg					
23	MG error in-phase null	mv	-60		+60		
24(15)	PHASE GENERATOR 3200 CPS readout	deg					
24(17)	PHASE GENERATOR 3200 CPS readout	deg					
24(19)	OG error phase shift	deg					
25	OG error in-phase null	mv	-60		+60		
26.a	Total OG TDA	volts			10		
26.b	Total MG TDA	volts			10		
26.c	Total IG TDA	volts			10		

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EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12619 REV M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	OG - Δθ abort	Refer to fig 3					
34.a.A	Amplitude	peak volts	4		10		
34.a.B	Pulse width	μsec	2		4		
34.a.C	Droop	volts			A/5		
34.a.D	Rise Time	μsec			0.5		
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
34.b	IRIG PVR	vdc					
34.c	IRIG Torque Current Monitor	vdc					
34.d	IRIG SF voltage	vdc					
41	OG + Δθ abort	Refer to fig 3					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μsec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12619 REV M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
42	OG TM Current CH4	amps	-0.125		+0.125		
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	IG - Δθ abort	Refer to fig 3					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μ sec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	IG + Δθ abort	Refer to fig 3					
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μ sec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12619
REV M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
60	IG TM Current on CH4	amps	-0.125		+0.125		
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
70	MG - Δθ abort	Refer to fig 3					
70.A	Amplitude	peak volts	4		10		
70.B	Pulse width	μ sec	2		4		
70.C	Droop	volts			$\frac{A}{5}$		
70.D	Rise Time	μ sec			0.5		
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
77	MG + Δθ abort	Refer to fig 3					
77.A	Amplitude	peak volts	4		10		
77.B	Pulse width	μ sec	2		4		
77.C	Droop	volts			$\frac{A}{5}$		
77.D	Rise Time	μ sec			0.5		
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12619
REV M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
78	MG TM Current on CH4	amps	-0.125		+0.125		
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
90	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
97	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
104	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

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DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal character stics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MBM
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
J	11-30-67	35183	1-4,6-9	All	EA	-
K	1-25-68	35482	2-10	All	EA	-
L	3-28-68	35978	4-11	2	EA	-
M	4-9-68	36046	2-4,7-9	-	EA	-
N	9-20-68	36844	1	-	EA	-

REFERENCES PS 6015000

IMPORTANT Insure that connector assembly (2003089) is connected to the LGC test connector.

INTERVAL

TOOLS AND MATERIAL

NOTE: Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

4. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 22 Displayed
i. VERB 36 ENTR

5. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR

STATIC LOOP PARAMETERS

6. Connect the 28 V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set Gimbal Servo Test selector on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

17A. Set CHANNEL 1 selector on Oscillograph Signal Selector panel to 2 to monitor the IG Error signal on the Oscillograph.

17B. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for CHANNEL 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

17C. Adjust PHASE ADJUST screw on CHANNEL 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of CHANNEL 1 pen.

17D. Set SENSITIVITY control for CHANNEL 1 to OFF.

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17E. Set CHANNEL 1 selector on Oscillograph Signal Selector panel to OFF.

18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

19A. Connect IG Error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

20. Set PAVM to the phase angle value recorded in step 19.

21. Read and record the voltage indicated on PAVM as the IG error in-phase null.

22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134, and Oscillograph Signal Selector panel CHANNEL 2 position 2.

23. Read and record the voltage indicated on PAVM as the MG error in-phase null.

24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133, and Oscillograph Signal Selector panel CHANNEL 3 position 2.

25. Read and record the voltage indicated on PAVM as the OG error in-phase null.

26. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

	Voltage	CROSSBAR CONTROL
a.	OG TDA	136
b.	MG TDA	137
c.	IG TDA	138

-OG FRICTION

27. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. VERB 41 NOUN 22 Displayed
i. VERB 36 NOUN 01 ENTR
j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing
l. 37777 ENTR
m. VERB 22 NOUN 01 Flashing
n. 37743 ENTR

28. Place jumpers between the following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2F (OG-ΔθAbort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)

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TPA #2	DIRECT PROBE	TB1-45	(hi) 49 (lo)
TPA #2	BUFFERED PROBE	TB2-35	(hi) 18 (lo)
TPA #2	PULSE PROBE	TB1-6 (Blu)	TB1-9 (Blk)

29. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

30. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.

31. Perform the following DSKY operations:

VERB 42 ENTR
VERB 33 ENTR

32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: If the measurements in step 34 cannot be completed before pulse torquing ends, perform step 35, repeat steps 27 and 31, and then complete measurements not taken.

34. Measure and record the following signals:

a. Scope indications A through E (figure 3)

NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.

b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

35. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

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+OG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

38. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing

e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37743		ENTR

44. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

45. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

46. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

47. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077		ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ abort signal on the oscilloscope.

56. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

-MG FRICTION TEST

61. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

62. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

63. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

64. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

65. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

66. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

67. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

68. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

69. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM

NOTE: Perform step 70 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends, perform step 71, repeat steps 61 and 67, and then complete measurements not taken.

70. Measure and record the oscilloscope indication of A through E as represented on figure 3.

71. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

72. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407		ENTR
k. VERB 21	NOUN 01	Flashing
l. 63777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

73. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.

74. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

75. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends, perform step 78, repeat steps 72 and 74, and then complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in figure 3.

78. When the Middle Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using

the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

79. Remove all jumper cables placed during this procedure.

80. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

81. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

82. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

83. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

84. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to VARIABLE. Set FILTER switches to HI.

IG STEP RESPONSE

85. Apply the 10^V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.

86. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

87. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

88. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

89. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

90. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

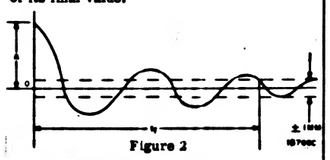


Figure 2

MG STEP RESPONSE

91. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

92. Apply the 5^V step input to the MG TDA test input by removing the jumper of step 85 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

93. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	20 MV/MM
c.	3	10 MV/MM

94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

95. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to off.

97. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

98. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

99. Apply the 5^V step input to the OG TDA test input by removing the jumper of step 92 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

100. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	20 MV/MM

101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

102. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t_f for the error signal to reach and stay within 1 mm of its final value.

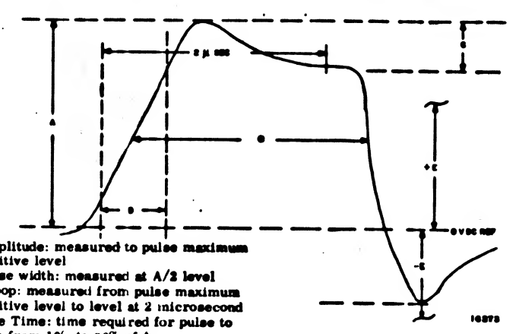
NORMALIZATION OF SYSTEM

105. Perform the following DSKY operation:

a. VERB 36		ENTR

106. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 3. Waveform Description

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

JDC NO. 12619 REV N
INITIAL TDRR 27:4

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME / AFFILIATION APPROVED BY NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
9	PHASE GENERATOR 3200 CPS readout	deg					
15	PHASE GENERATOR 3200 CPS readout	deg					
17	PHASE GENERATOR 3200 CPS readout	deg					
19	IG error phase shift	deg					
21	IG error in-phase null	mv	-60		+60		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12619 REV N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22(15)	PHASE GENERATOR 3200 CPS readout	deg					
22(17)	PHASE GENERATOR 3200 CPS readout	deg					
22(19)	MG error phase shift	deg					
23	MG error in-phase null	mv	-60		+60		
24(15)	PHASE GENERATOR 3200 CPS readout	deg					
24(17)	PHASE GENERATOR 3200 CPS readout	deg					
24(19)	OG error phase shift	deg					
25	OG error in-phase null	mv	-60		+60		
26.a	Total OG TDA	volts			10		
26.b	Total MG TDA	volts			10		
26.c	Total IG TDA	volts			10		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12619 REV N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	OG - Δθ abort	Refer to fig 3					
34.a.A	Amplitude	peak volts	4		10		
34.a.B	Pulse width	μ sec	2		4		
34.a.C	Droop	volts			A/5		
34.a.D	Rise Time	μ sec			0.5		
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
34.b	IRIG PVR	vdc					
34.c	IRIG Torque Current Monitor	vdc					
34.d	IRIG SF voltage	vdc					
41	OG + Δθ abort	Refer to fig 3					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μ sec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12619 REV N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
42	OG TM Current CH4	amps	-0.125		+0.125		
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	IG - Δθ abort	Refer to fig 3					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μ sec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	IG + Δθ abort	Refer to fig 3					
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μ sec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12619
REV. N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
60	IG TM Current on CH4	amps	-0.125		+0.125		
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
70	MG - Δθ abort	Refer to fig 3					
70.A	Amplitude	peak volts	4		10		
70.B	Pulse width	μ sec	2		4		
70.C	Droop	volts			$\frac{A}{5}$		
70.D	Rise Time	μ sec			0.5		
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
77	MG + Δθ abort	Refer to fig 3					
77.A	Amplitude	peak volts	4		10		
77.B	Pulse width	μ sec	2		4		
77.C	Droop	volts			$\frac{A}{5}$		
77.D	Rise Time	μ sec			0.5		
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12619
REV. N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
78	MG TM Current on CH4	amps	-0.125		+0.125		
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
90	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
97	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
104	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

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JOB GIMBAL RESPONSE TEST

INITIAL TDRR 27134 D.S. PGS 6

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the fine and coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus $\Delta\theta$ abort signal (see below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MI	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACN
B	7-21-66	30273	-	2	EA	MB
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
J	11-30-67	35183	1-4,6-9	All	EA	-
K	1-25-68	35482	2-10	All	EA	-
L	3-28-68	35978	4-11	2	EA	-
M	4-9-68	36046	2-4,7-9	-	EA	-
N	9-20-68	36844	1	-	EA	-
P	11-12-68	37020	All	All	EA	-

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)
characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG, and IG stabilization loop responses are tested by providing a step input to each DC stabilization amplifier.

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

NOTE: Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12619 CTS UPLINK Tape, P/N 2901657-001.

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.
b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.
c. Set digitswitches on Self Test Assembly to 00000.
d. Self Test panel - Press to light SELF TEST pushbutton.
e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape.
f. Programmer and Monitor panel - Press to light AGC INPUT - CTR and TAPE FREE RUN pushbuttons.
g. RDC Interface panel - Press to light CH33-10 pushbutton.
h. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

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MANUAL LOAD PROCEDURES

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.
3. Measure and record 28 VDC Bus voltage indicated on Digital Voltmeter (DVM).
4. Perform following DSKY operations:
   a. VERB 41 NOUN 20 ENTR
   b. Observe: VERB 21 NOUN 22 Flashing
   c. +00000 ENTR
   d. Observe: VERB 22 NOUN 22 Flashing
   e. +00000 ENTR
   f. Observe: VERB 23 NOUN 22 Flashing
   g. +00000 ENTR
   h. Observe: VERB 41 NOUN 22 Displayed
   i. VERB 36 ENTR
5. Perform following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 00370 ENTR
   c. 16002 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

i. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.

INITIALIZATION

4. Press EXECUTE pushbutton on Programmer and Monitor panel.

4A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES
STATIC LOOP PARAMETERS

CTS UPLINK TAPE LOAD PROCEDURES
STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.
7. Set REFERENCE switch to 4.
8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)
9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.
12. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.
13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.
14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

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15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 2 to monitor IG error signal on Oscillograph.

19. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

20. Adjust PHASE ADJUST screw on Channel 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 1 pen.

21. Set SENSITIVITY control for Channel 1 to OFF.

22. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to OFF.

23. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

24. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

25. Connect IG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

26. Set PAVM to phase angle value recorded in step 24.

27. Read and record voltage indicated on PAVM as IG error in-phase null.

28. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

29. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

30. Set GIMBAL SERVO TEST switch on Test Selector panel to 2 and press to light GIMBAL SERVO TEST pushbutton.

31. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.

32. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

33. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

34. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This

condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

35. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

36. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 2 to monitor MG error signal on Oscillograph.

37. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 2 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

38. Adjust PHASE ADJUST screw on Channel 2 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 2 pen.

39. Set SENSITIVITY control for Channel 2 to OFF.

40. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to OFF.

41. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.

42. Calculate the average of the values obtained in steps 33 and 35. Subtract the value recorded in step 9 from the average and record result.

43. Connect MG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

44. Set PAVM to phase angle value recorded in step 42.

45. Read and record voltage indicated on PAVM as the MG error in-phase null.

46. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

47. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

48. Set GIMBAL SERVO TEST switch on Test Selector panel to 3 and press to light GIMBAL SERVO TEST pushbutton.

49. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.

50. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

51. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

52. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

53. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

MANUAL LOAD PROCEDURES

54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph.

CTS UPLINK TAPE LOAD PROCEDURES

54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph. Press to light CH3 AC pushbutton.

55. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 3 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

56. Adjust Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 3 pen.

57. Set SENSITIVITY control for Channel 3 to OFF.

58. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to OFF.

59. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.

60. Calculate the average of the values obtained in steps 51 and 53. Subtract the value recorded in step 9 from the average and record result.

61. Connect OG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

62. Set PAVM to phase angle value recorded in step 60.

63. Read and record the voltage indicated on PAVM as the OG error in-phase null.

MANUAL LOAD PROCEDURES

64. Set CROSSBAR CONTROL on Primary Signal Selector panel to monitor following signals on PAVM. Record total value of each:

	Voltage	CROSSBAR CONTROL
a.	OG TDA	136
b.	MG TDA	137
c.	IG TDA	138

-OG FRICTION TEST

65. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR
h.	Observe:		
	VERB 41	NOUN 22	Displayed
i.	VERB 21	NOUN 01	ENTR
j.	00403		ENTR
k.	37777		ENTR
l.	NOUN 15		ENTR
m.	37743		ENTR ENTR
n.	00000		ENTR ENTR
o.	00000		ENTR ENTR
p.	00000		ENTR ENTR
q.	00000		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

-OG FRICTION TEST

65. Press EXECUTE pushbutton on Programmer and Monitor panel.

65A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

66. Connect jumpers between following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2-F (OG -Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA#2	DIRECT PROBE	TB1-45(hi) TB1-49(lo)
TPA#2	BUFFERED PROBE	TB2-35(hi) TB2-18(lo)
TPA#2	PULSE PROBE	TB1-6(Blu) TB1-9(Blk)

67. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. OG CDU fine error on Channel 3
b. OG TM current on Channel 4
c. OG CDU coarse error on Channel 5.

68. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to 800~ 0 DEG and FILTER switches are set to LO.

MANUAL LOAD PROCEDURES

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 69.

69. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

69. Press EXECUTE pushbutton on Programmer and Monitor panel.

70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

71. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: If measurements in step 72 cannot be completed before pulse torquing ends, perform step 73, repeat steps 65 and 69, and then complete measurements not taken.

NOTE: If measurements in step 72 cannot be completed before pulse torquing ends, perform steps 73 and 73A, complete measurements not taken and then proceed to step 73B. If measurements in step 72 are completed before pulse torquing ends, perform steps 73 and 73A and then proceed to step 73B.

72. Measure and record following signals:

a. Scope indications A through E as represented on Figure 1.

MANUAL LOAD PROCEDURES

NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA#1.

b. IRIG PVR (PIPA & IRIG SF MONITOR switch on TPA#1 to position 10) on Current Source Monitor panel per JDC 18216.

c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 11) on Current Source Monitor panel per JDC 18216.

d. IRIG Scale Factor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 12) on Current Source Monitor panel per JDC 18216.

73. When Outer Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

CTS UPLINK TAPE LOAD PROCEDURES

73A. Perform following operations:

a. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

+OG FRICTION TEST

74. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 73A. g.

g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.

+OG FRICTION TEST

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

74A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe:
VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00403 ENTR

k. Observe:
VERB 21 NOUN 01 Flashing

l. 40000 ENTR

m. Observe:
VERB 22 NOUN 01 Flashing

n. 40077 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

74B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

75. Remove jumper from J2-F on Auxiliary Input panel and connect it to J2-E to monitor OG +Δθ abort signal on Dual Beam Oscilloscope.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 76.

76. Perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

76. Press EXECUTE pushbutton on Programmer and Monitor panel.

77. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

78. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

MANUAL LOAD PROCEDURES

-IG FRICTION TEST

81. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe:
VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00405 ENTR

k. Observe:
VERB 21 NOUN 01 Flashing

l. 37777 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

c. CHANNEL 5 to 50 MV/MM.

79. Measure and record Oscilloscope indications A through E as represented on Figure 1.

80. When Outer Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF and record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

81. Press EXECUTE pushbutton on Programmer and Monitor panel.

81A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81F. When VERB 22 NOUN 01 flash on

MANUAL LOAD PROCEDURES

m. Observe:
VERB 22 NOUN 01 Flashing
n. 37743 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

82. Remove jumper from J2-E on Auxiliary Input panel and connect it to J2-B to monitor IG -Δθ abort signal on Oscilloscope.

83. Remove jumper from TB1-45 and connect it to TB2-31 on TPA#2.

84. Remove jumper from TB2-35 and connect it to TB2-47 on TPA#2.

85. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. IG CDU fine error on Channel 1
b. IG TM current on Channel 4
c. IG CDU coarse error on Channel 5.

86. Insure that CH4DC and CH5AC push-buttons on Oscillograph Signal Selector panel are lighted.

87. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

87. Press EXECUTE pushbutton on Programmer and Monitor panel.

88. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

89. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

90. Measure and record Oscilloscope indications A through E as represented on Figure 1.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

91. When Inner Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

+IG FRICTION TEST

92. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe:
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00405 ENTR
k. Observe:
VERB 21 NOUN 01 Flashing
l. 40000 ENTR
m. Observe:
VERB 22 NOUN 01 Flashing
n. 40077 ENTR

+IG FRICTION TEST

92. Press EXECUTE pushbutton on Programmer and Monitor panel.

92A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

92B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

92C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

92D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE push-button on Programmer and Monitor panel.

92E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

92F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

93. Remove jumper from J2-B on Auxiliary Input panel and connect it to J2-A to monitor IG +Δθ abort signal on Oscilloscope.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 94.

94. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

94. Press EXECUTE pushbutton on Programmer and Monitor panel.

95. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

96. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

97. Measure and record Oscilloscope indications A through E as represented on Figure 1.

98. When Inner Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5. Using equation given in Figure 2, calculate the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

99. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR

-MG FRICTION TEST

99. Press EXECUTE pushbutton on Programmer and Monitor panel.

99A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +06750 ENTR
h. Observe:
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe:
VERB 21 NOUN 01 Flashing
l. 14000 ENTR
m. Observe:
VERB 22 NOUN 01 Flashing
n. 00000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

99B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

99C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

99D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE push-button on Programmer and Monitor panel.

99E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

99F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

100. Remove jumper from J2-A of Auxiliary Input panel and connect it to J2-D to monitor MG -Δθ abort signal on Oscilloscope.

101. Remove jumper from TB2-31 and connect it to TB2-32 on TPA#2.

102. Remove jumper from TB2-47 and connect it to TB2-41 on TPA#2.

103. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. MG CDU fine error on Channel 2
b. MG TM current on Channel 4
c. MG CDU coarse error on Channel 5.

104. Insure that CH4DC and CH5AC push-buttons on Oscillograph Signal Selector panel are lighted.

MANUAL LOAD PROCEDURES

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 105.

105. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

105. Press EXECUTE pushbutton on Programmer and Monitor panel.

106. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

107. Set sensitivities on Oscillograph Amplifiers as follows:
a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 108 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurements cannot be completed before pulse torquing ends, perform step 109, repeat steps 99 and 105, and then complete measurements not taken.

NOTE: Perform step 108 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurements cannot be completed before pulse torquing ends, perform steps 109 and 109A, complete measurements not taken and then proceed to step 109B. If measurements in step 108 are completed before pulse torquing ends, perform steps 109 and 109A and then proceed to step 109B.

108. Measure and record Oscilloscope indications A through E as represented in Figure 1.

MANUAL LOAD PROCEDURES

109. When Middle Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

CTS UPLINK TAPE LOAD PROCEDURES

109A. Perform following operations:
a. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 109A.g.

g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

109B. Insure that Outer Gimbal indicator on Gimbal Position Control panel has stopped before proceeding.

MANUAL LOAD PROCEDURES
+MG FRICTION TEST

110. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. -06750 ENTR
h. Observe:
VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR
j. 00407 ENTR
k. Observe:
VERB 21 NOUN 01 Flashing
l. 63777 ENTR
m. Observe:
VERB 22 NOUN 01 Flashing
n. 40000 ENTR

CTS UPLINK TAPE LOAD PROCEDURES
+MG FRICTION TEST

110. Press EXECUTE pushbutton on Programmer and Monitor panel.

110A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

110B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

110C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

110D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

110E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

110F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

111. Remove jumper from J2-D of Auxiliary Input panel and connect it to J2-C to monitor MG +Δθ abort signal on Oscilloscope.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 112.

112. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

112. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

113. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

114. Set sensitivities on Oscillograph Amplifiers as follows:
a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Perform step 115 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurements cannot be completed before pulse torquing ends, perform step 116, repeat steps 110 and 112, and then complete measurements not taken.

NOTE: Perform step 115 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurements cannot be completed before pulse torquing ends perform steps 116 and 116A, complete measurements not taken and then proceed to step 116B. If measurements in step 115 are completed before pulse torquing ends, perform steps 116 and 116A and then proceed to step 116B.

115. Measure and record Oscilloscope indications A through E as represented in Figure 1.

116. When Middle Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
2 and 5 on data sheet. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.	
	116A. Perform following operations: a. Press EXECUTE pushbutton on Programmer and Monitor panel. b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 116A. g. g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 116B. Insure that Outer Gimbal indicator on Gimbal Position Control panel has stopped before proceeding.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	117. Remove all jumper cables connected during this procedure.
118. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe: VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe: VERB 41 NOUN 22 Displayed	118. Press EXECUTE pushbutton on Programmer and Monitor panel. 118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Observe VERB 41 NOUN 22 are displayed on DSKY.
	119. Set following controls on Oscillograph Signal Selector panel to monitor the associated signals: a. CHANNEL Switch Position 1-2 — Signal IG&Y Gyro Error Signal b. 2-2 — MG Error Signal c. 3-2 — OG Error Signal
	120. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.
121. Enter VERB 36 into DSKY and press ENTR pushbutton.	121. Press EXECUTE pushbutton on Programmer and Monitor panel.
	122. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of Channels 1, 2, and 3 to VARIABLE. Set FILTER switches to HI.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
IG STEP RESPONSE	IG STEP RESPONSE
	123. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 and TB2-11 of TPA#2. 124. Press CHART SPEEDS 200 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows: a. CHANNEL 1 to 20 MV/MM b. CHANNEL 2 to 10 MV/MM c. CHANNEL 3 to 10 MV/MM. 125. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 3) of 20mm. Continue holding SERVO TEST switch to ON. 126. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC. 127. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF. 128. Determine and record the number of error signal oscillation peaks outside ±1mm of the final value. (See figure 3.) Record magnitude A. Record the time (t_f) for the error signal to reach and stay within 1mm of its final value.
MG STEP RESPONSE	MG STEP RESPONSE
129. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR	129. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
b. Observe: VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe: VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 22 Flashing g. +00000 ENTR h. Observe: VERB 41 NOUN 22 Displayed i. VERB 36 ENTR	129A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 129B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 129C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 129D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
	130. Apply the 5V step input to MG TDA test input by removing jumper connected in step 123 and connecting it between TB5-18 and TB2-10 of TPA#2. 131. Set sensitivities on Oscillograph Amplifiers as follows: a. CHANNEL 1 to 10 MV/MM b. CHANNEL 2 to 10 MV/MM c. CHANNEL 2 to 10 MV/MM. 132. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20mm. (Rotate PHASE ADJUST control as necessary if unable to obtain a 20mm pen deflection.) Continue holding SERVO TEST switch to ON. 133. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

MANUAL LOAD PROCEDURES

134. After observing a constant servo error on Channel 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

135. Determine and record the number of error signal oscillation peaks outside ±1mm of the final value. (See figure 3.) Record magnitude A. Record the time (t_f) for the error signal to reach and stay within 1mm of its final value.

OG STEP RESPONSE

136. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

137. Apply the 5V step input to OG TDA test input by removing jumper connected in step 130 and connecting it between TB5-18 and TB2-4 of TPA#2.

138. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM

CTS UPLINK TAPE LOAD PROCEDURES

OG STEP RESPONSE

136. Press EXECUTE pushbutton on Programmer and Monitor panel.

136A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

136B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

136C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

136D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 20 MV/MM.

139. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 3 Oscillograph Amplifier to obtain a step input amplitude A (See figure 3) of 20mm. Continue holding SERVO TEST switch to ON.

140. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

141. After observing a constant servo error on Channel 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

142. Determine and record the number of error signal oscillation peaks outside ±1mm of the final value. (See Figure 3.) Record magnitude A. Record the time (t_f) for the error signal to reach and stay within 1mm of its final value.

NORMALIZATION OF SYSTEM

143. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

NORMALIZATION OF SYSTEM

143. Press EXECUTE pushbutton on Programmer and Monitor panel.

143A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

143B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

143C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

144. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

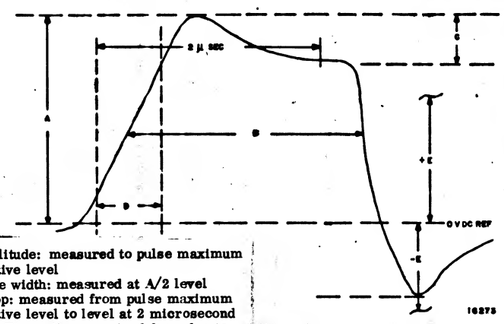
145. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

146. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

147. Set Power switch on Tape Reader to OFF and remove tape.

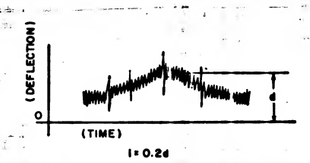
148. Press to extinguish SELF TEST pushbutton on Self Test panel.

149. Remove Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise; (No pulse)

Figure 1. Waveform Description



i = 0.2d
Where: 0.2 is Oscillograph sensitivity in volts per centimeter.
d is deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 2.

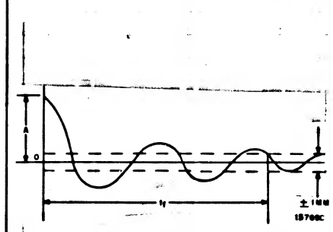


Figure 3.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

JDC NO. 12619 REV P
INITIAL TDRR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. _____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
9	PHASE GENERATOR 3200 CPS readout	deg					
15	PHASE GENERATOR 3200 CPS readout	deg					
17	PHASE GENERATOR 3200 CPS readout	deg					
24	IG error phase shift	deg					
27	IG error in-phase null	mv	-60		+60		
33	PHASE GENERATOR 3200 CPS readout	deg					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12619 REV P

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	PHASE GENERATOR 3200 CPS readout	deg					
42	MG error phase shift	deg					
45	MG error in-phase null	mv	-60		+60		
51	PHASE GENERATOR 3200 CPS readout	deg					
53	PHASE GENERATOR 3200 CPS readout	deg					
60	OG error phase shift	deg					
63	OG error in-phase null	mv	-60		+60		
64.a	Total OG TDA	volts			10		
64.b	Total MG TDA	volts			10		
64.c	Total IG TDA	volts			10		
72	OG -Δθ abort	Refer to fig 1					
72.a.A	Amplitude	peak volts	4		10		
72.a.B	Pulse width	μsec	2		4		
72.a.C	Droop	volts			A/5		
72.a.D	Rise Time	μsec			0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12619 REV P

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
72.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
72.b	IRIG PVR	vdc					
72.c	IRIG Torque Current Monitor	vdc					
72.d	IRIG SF voltage	vdc					
79	OG +Δθ abort	Refer to fig 1					
79.A	Amplitude	peak volts	4		10		
79.B	Pulse width	μsec	2		4		
79.C	Droop	volts			A/5		
79.D	Rise Time	μsec			0.5		
79.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
80	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
80	OG TM Current CH4	amps	-0.125		+0.125		
80	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
90	IG - Δθ abort	Refer to fig 1					
90.A	Amplitude	peak volts	4		10		
90.B	Pulse width	μsec	2		4		
90.C	Droop	volts			A/5		

DATE _____

FORM 00147
Chg. 8-29-63

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12619 REV P

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
90.D	Rise Time	μsec			0.5		
90.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
97	IG + Δθ abort	Refer to fig 1					
97.A	Amplitude	peak volts	4		10		
97.B	Pulse width	μsec	2		4		
97.C	Droop	volts			A/5		
97.D	Rise Time	μsec			0.5		
97.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
98	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
98	IG TM Current on CH4	amps	-0.125		+0.125		
98	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
108	MG -Δθ abort	Refer to fig 1					
108.A	Amplitude	peak volts	4		10		
108.B	Pulse width	μsec	2		4		
108.C	Droop	volts			A/5		
108.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12619
REV. P

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
108.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
115	MG + Δθ abort	Refer to fig 1					
115.A	Amplitude	peak volts	4		10		
115.B	Pulse width	μsec	2		4		
115.C	Droop	volts			A/5		
115.D	Rise Time	μsec			0.5		
115.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
116	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
116	MG TM Current on CH4	amps	-0.125		+0.125		
116	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
128	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
135	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12619
REV. P

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
142	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

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JOB GIMBAL RESPONSE TEST

INITIAL TDRR 27134 D.S. PGS 3

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the fine and coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal (see below)

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	7-5-66	30046	1 - 7	2	MM	ACM
B	7-21-66	30273	-	2	EA	MBT
C	8-5-66	30522	2,4,6-9	1	EA	-
D	8-18-66	30702	-	1	EA	-
E	11-10-66	31903	2,3	-	EA	-
F	1-12-67	32605	2	1	EA	-
G	1-18-67	32668	2	-	EA	-
H	2-2-67	32889	All	1,4	EA	-
J	11-30-67	35183	1-4,6-9	All	EA	-
K	1-25-68	35482	2-10	All	EA	-
L	3-28-68	35978	4-11	2	EA	-
M	4-9-68	36046	2-4,7-9	-	EA	-
N	9-20-68	36844	1	-	EA	-
P	11-12-68	37020	All	All	EA	-
R	12-3-68	37085	2, 31	-	EA	-

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL See appropriate section of JDC

DESCRIPTION (cont)
characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG, and IG stabilization loop responses are tested by providing a step input to each DC stabilization amplifier.

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

NOTE: Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

NOTE: This JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL: None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL: JDC 12619 CTS UPLINK Tape, P/N 2901657-001.

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.

b. Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.

c. Set digitswitches on Self Test Assembly to 00000.

d. Self Test panel -
Press to light SELF TEST pushbutton.

e. Tape Reader -
Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

f. Programmer and Monitor panel -
Press to light AGC INPUT - CTR and TAPE FREE RUN pushbuttons.

g. RDC Interface panel -
Press to light CH33-10 pushbutton.

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MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

h. XY Interface panel -
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

i. Programmer and Monitor panel -
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.
Press EXECUTE pushbutton.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.

2. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.

3. Measure and record 28 VDC Bus voltage indicated on Digital Voltmeter (DVM).

4. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

5. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR

INITIALIZATION

4. Press EXECUTE pushbutton on Programmer and Monitor panel.

4A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

4D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

5. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES
STATIC LOOP PARAMETERS

CTS UPLINK TAPE LOAD PROCEDURES
STATIC LOOP PARAMETERS

6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.

7. Set REFERENCE switch to 4.

8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)

9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.

12. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.

13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.

14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

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15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

18. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 2 to monitor IG error signal on Oscillograph.

19. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

20. Adjust PHASE ADJUST screw on Channel 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 1 pen.

21. Set SENSITIVITY control for Channel 1 to OFF.

22. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to OFF.

23. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.

24. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

25. Connect IG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.

26. Set PAVM to phase angle value recorded in step 24.

27. Read and record voltage indicated on PAVM as IG error in-phase null.

28. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

29. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

30. Set GIMBAL SERVO TEST switch on Test Selector panel to 2 and press to light GIMBAL SERVO TEST pushbutton.

31. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.

32. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

33. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

34. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This

condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

35. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

36. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 2 to monitor MG error signal on Oscillograph.

37. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 2 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

38. Adjust PHASE ADJUST screw on Channel 2 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 2 pen.

39. Set SENSITIVITY control for Channel 2 to OFF.

40. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to OFF.

41. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.

42. Calculate the average of the values obtained in steps 33 and 35. Subtract the value recorded in step 9 from the average and record result.

43. Connect MG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.

44. Set PAVM to phase angle value recorded in step 42.

45. Read and record voltage indicated on PAVM as the MG error in-phase null.

46. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

47. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.

48. Set GIMBAL SERVO TEST switch on Test Selector panel to 3 and press to light GIMBAL SERVO TEST pushbutton.

49. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.

50. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

51. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

52. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

53. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

MANUAL LOAD PROCEDURES

54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph.

CTS UPLINK TAPE LOAD PROCEDURES

54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph. Press to light CH3 AC pushbutton.

55. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 3 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

56. Adjust Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 3 pen.

57. Set SENSITIVITY control for Channel 3 to OFF.

58. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to OFF.

59. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.

60. Calculate the average of the values obtained in steps 51 and 53. Subtract the value recorded in step 9 from the average and record result.

61. Connect OG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

62. Set PAVM to phase angle value recorded in step 60.

63. Read and record the voltage indicated on PAVM as the OG error in-phase null.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

64. Set CROSSBAR CONTROL on Primary Signal Selector panel to monitor following signals on PAVM. Record total value of each:

a. Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION TEST

65. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 21	NOUN 01	ENTR
j. 00403		ENTR
k. 37777		ENTR
l. NOUN 15		ENTR
m. 37743		ENTR ENTR
n. 00000		ENTR ENTR
o. 00000		ENTR ENTR
p. 00000		ENTR ENTR
q. 00000		ENTR

-OG FRICTION TEST

65. Press EXECUTE pushbutton on Programmer and Monitor panel.

65A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

66. Connect jumpers between following points:

GSE	From	To
AIP	DIRECT PROBES OUTPUT	CH4DC
AIP	BUFFERED PROBES OUTPUT	CH5AC
AIP	J2-F (OG -Δθ Abort)	J1-A (Scope B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A TRIGGER IN, (in AIP)
TPA#2	DIRECT PROBE	TB1-45(hi)
		TB1-49(lo)
TPA#2	BUFFERED PROBE	TB2-35(hi)
		TB2-18(lo)
TPA#2	PULSE PROBE	TB1-6(Blu)
		TB1-9(Blk)

67. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. OG CDU fine error on Channel 3
b. OG TM current on Channel 4
c. OG CDU coarse error on Channel 5.

68. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to 800~ 0 DEG and FILTER switches are set to LO.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 69.

69. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

69. Press EXECUTE pushbutton on Programmer and Monitor panel.

70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

71. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

NOTE: If measurements in step 72 cannot be completed before pulse torquing ends, perform step 73, repeat steps 65 and 69, and then complete measurements not taken.

NOTE: If measurements in step 72 cannot be completed before pulse torquing ends, perform steps 73 and 73A, complete measurements not taken and then proceed to step 73B. If measurements in step 72 are completed before pulse torquing ends, perform steps 73 and 73A and then proceed to step 73B.

72. Measure and record following signals:

a. Scope indications A through E as represented on Figure 1.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA#1.

b. IRIG PVR (PIPA & IRIG SF MONITOR switch on TPA#1 to position 10) on Current Source Monitor panel per JDC 18216.

c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 11) on Current Source Monitor panel per JDC 18216.

d. IRIG Scale Factor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 12) on Current Source Monitor panel per JDC 18216.

73. When Outer Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

73A. Perform following operations:

a. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 73A. g.

g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.

+OG FRICTION TEST

74. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR

+OG FRICTION TEST

74. Press EXECUTE pushbutton on Programmer and Monitor panel.

74A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00403		ENTR
k. Observe:		
VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. Observe:		
VERB 22	NOUN 01	Flashing
n. 40077		ENTR

74B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

74F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

75. Remove jumper from J2-F on Auxiliary Input panel and connect it to J2-E to monitor OG $+\Delta\theta$ abort signal on Dual Beam Oscilloscope.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 76.

76. Perform following DSKY operations:

a. VERB 42	ENTR
b. VERB 33	ENTR

76. Press EXECUTE pushbutton on Programmer and Monitor panel.

77. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

78. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

MANUAL LOAD PROCEDURES | CTS UPLINK TAPE LOAD PROCEDURES

c. CHANNEL 5 to 50 MV/MM.

79. Measure and record Oscilloscope indications A through E as represented on Figure 1.

80. When Outer Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF and record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

81. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. Observe:		
VERB 21	NOUN 01	Flashing
l. 37777		ENTR

-IG FRICTION TEST

81. Press EXECUTE pushbutton on Programmer and Monitor panel.

81A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

81F. When VERB 22 NOUN 01 flash on

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
m. Observe:	DSKY, press EXECUTE pushbutton on
VERB 22 NOUN 01 Flashing	Programmer and Monitor panel.
n. 37743 ENTR	

82. Remove jumper from J2-E on Auxiliary Input panel and connect it to J2-B to monitor IG $-\Delta\theta$ abort signal on Oscilloscope.

83. Remove jumper from TB1-45 and connect it to TB2-31 on TPA#2.

84. Remove jumper from TB2-35 and connect it to TB2-47 on TPA#2.

85. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. IG CDU fine error on Channel 1
b. IG TM current on Channel 4
c. IG CDU coarse error on Channel 5.

86. Insure that CH4DC and CH5AC push-buttons on Oscillograph Signal Selector panel are lighted.

87. Perform following DSKY operations:	87. Press EXECUTE pushbutton on
a. VERB 42 ENTR	Programmer and Monitor panel.
b. VERB 33 ENTR	

88. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

89. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

90. Measure and record Oscilloscope indications A through E as represented on Figure 1.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	91. When Inner Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.
+IG FRICTION TEST	+IG FRICTION TEST
92. Perform following DSKY operations:	92. Press EXECUTE pushbutton on
a. VERB 41 NOUN 20 ENTR	Programmer and Monitor panel.
b. Observe:	92A. When VERB 21 NOUN 22 flash on
VERB 21 NOUN 22 Flashing	DSKY, press EXECUTE pushbutton on
c. +00000 ENTR	Programmer and Monitor panel.
d. Observe:	92B. When VERB 22 NOUN 22 flash on
VERB 22 NOUN 22 Flashing	DSKY, press EXECUTE pushbutton on
e. +00000 ENTR	Programmer and Monitor panel.
f. Observe:	92C. When VERB 23 NOUN 22 flash on
VERB 23 NOUN 22 Flashing	DSKY, press EXECUTE pushbutton on
g. +00000 ENTR	Programmer and Monitor panel.
h. Observe:	92D. When VERB 41 NOUN 22 are
VERB 41 NOUN 22 Displayed	displayed on DSKY, press EXECUTE push-
i. VERB 24 NOUN 01 ENTR	button on Programmer and Monitor panel.
j. 00405 ENTR	92E. When VERB 21 NOUN 01 flash on
k. Observe:	DSKY, press EXECUTE pushbutton on
VERB 21 NOUN 01 Flashing	Programmer and Monitor panel.
l. 40000 ENTR	92F. When VERB 22 NOUN 01 flash on
m. Observe:	DSKY, press EXECUTE pushbutton on
VERB 22 NOUN 01 Flashing	Programmer and Monitor panel.
n. 40077 ENTR	

93. Remove jumper from J2-B on Auxiliary Input panel and connect it to J2-A to monitor IG $+\Delta\theta$ abort signal on Oscilloscope.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 94.
94. Perform following DSKY operations:	94. Press EXECUTE pushbutton on
a. VERB 42 ENTR	Programmer and Monitor panel.
b. VERB 33 ENTR	

95. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

96. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 0.2 V/CM
c. CHANNEL 5 to 50 MV/MM.

97. Measure and record Oscilloscope indications A through E as represented on Figure 1.

98. When Inner Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5. Using equation given in Figure 2, calculate the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

-MG FRICTION TEST	-MG FRICTION TEST
99. Perform following DSKY operations:	99. Press EXECUTE pushbutton on
a. VERB 41 NOUN 20 ENTR	Programmer and Monitor panel.
b. Observe:	99A. When VERB 21 NOUN 22 flash on
VERB 21 NOUN 22 Flashing	DSKY, press EXECUTE pushbutton on
c. +00000 ENTR	Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
d. Observe:	99B. When VERB 22 NOUN 22 flash on
VERB 22 NOUN 22 Flashing	DSKY, press EXECUTE pushbutton on
e. +00000 ENTR	Programmer and Monitor panel.
f. Observe:	99C. When VERB 23 NOUN 22 flash on
VERB 23 NOUN 22 Flashing	DSKY, press EXECUTE pushbutton on
g. +06750 ENTR	Programmer and Monitor panel.
h. Observe:	99D. When VERB 41 NOUN 22 are
VERB 41 NOUN 22 Displayed	displayed on DSKY, press EXECUTE push-
i. VERB 24 NOUN 01 ENTR	button on Programmer and Monitor panel.
j. 00407 ENTR	99E. When VERB 21 NOUN 01 flash on
k. Observe:	DSKY, press EXECUTE pushbutton on
VERB 21 NOUN 01 Flashing	Programmer and Monitor panel.
l. 14000 ENTR	99F. When VERB 22 NOUN 01 flash on
m. Observe:	DSKY, press EXECUTE pushbutton on
VERB 22 NOUN 01 Flashing	Programmer and Monitor panel.
n. 00000 ENTR	

100. Remove jumper from J2-A of Auxiliary Input panel and connect it to J2-D to monitor MG $-\Delta\theta$ abort signal on Oscilloscope.

101. Remove jumper from TB2-31 and connect it to TB2-32 on TPA#2.

102. Remove jumper from TB2-47 and connect it to TB2-41 on TPA#2.

103. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. MG CDU fine error on Channel 2
b. MG TM current on Channel 4
c. MG CDU coarse error on Channel 5.

104. Insure that CH4DC and CH5AC push-buttons on Oscillograph Signal Selector panel are lighted.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 105.
105. Perform following DSKY operations: a. VERB 42 ENTR b. VERB 33 ENTR	105. Press EXECUTE pushbutton on Programmer and Monitor panel.
	106. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.
	107. Set sensitivities on Oscillograph Amplifiers as follows: a. CHANNEL 2 to 5 MV/MM b. CHANNEL 4 to 0.2 V/CM c. CHANNEL 5 to 50 MV/MM.
NOTE: Perform step 108 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurements cannot be completed before pulse torquing ends, perform step 109, repeat steps 99 and 105, and then complete measurements not taken.	NOTE: Perform step 108 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurements cannot be completed before pulse torquing ends, perform steps 109 and 109A, complete measurements not taken and then proceed to step 109B. If measurements in step 108 are completed before pulse torquing ends, perform steps 109 and 109A and then proceed to step 109B.
	108. Measure and record Oscilloscope indications A through E as represented in Figure 1.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	109. When Middle Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.
	109A. Perform following operations: a. Press EXECUTE pushbutton on Programmer and Monitor panel. b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 109A. g. g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
	109B. Insure that Outer Gimbal indicator on Gimbal Position Control panel has stopped before proceeding.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
+MG FRICTION TEST	+MG FRICTION TEST
110. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing c. +00000 ENTR d. Observe: VERB 22 NOUN 22 Flashing e. +00000 ENTR f. Observe: VERB 23 NOUN 22 Flashing g. -06750 ENTR h. Observe: VERB 41 NOUN 22 Displayed i. VERB 24 NOUN 01 ENTR j. 00407 ENTR k. Observe: VERB 21 NOUN 01 Flashing l. 63777 ENTR m. Observe: VERB 22 NOUN 01 Flashing n. 40000 ENTR	110. Press EXECUTE pushbutton on Programmer and Monitor panel. 110A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 110B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 110C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 110D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 110E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 110F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
	111. Remove jumper from J2-D of Auxiliary input panel and connect it to J2-C to monitor MG +Δθ abort signal on Oscilloscope.
	NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 112.
112. Perform following DSKY operations: a. VERB 42 ENTR b. VERB 33 ENTR	112. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
	113. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.
	114. Set sensitivities on Oscillograph Amplifiers as follows: a. CHANNEL 2 to 5 MV/MM b. CHANNEL 4 to 0.2 V/CM c. CHANNEL 5 to 50 MV/MM.
NOTE: Perform step 115 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurements cannot be completed before pulse torquing ends, perform step 116, repeat steps 110 and 112, and then complete measurements not taken.	NOTE: Perform step 115 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurements cannot be completed before pulse torquing ends perform steps 116 and 116A, complete measurements not taken and then proceed to step 116B. If measurements in step 115 are completed before pulse torquing ends, perform steps 116 and 116A and then proceed to step 116B.
	115. Measure and record Oscilloscope indications A through E as represented in Figure 1.
	116. When Middle Gimbal indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels

MANUAL LOAD PROCEDURES

2 and 5 on data sheet. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

CTS UPLINK TAPE LOAD PROCEDURES

116A. Perform following operations:

a. Press EXECUTE pushbutton on Programmer and Monitor panel.

b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 116A. g.

g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

116B. Insure that Outer Gimbal indicator on Gimbal Position Control panel has stopped before proceeding.

MANUAL LOAD PROCEDURES

117. Remove all jumper cables connected during this procedure.

118. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed

CTS UPLINK TAPE LOAD PROCEDURES

118. Press EXECUTE pushbutton on Programmer and Monitor panel.

118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Observe VERB 41 NOUN 22 are displayed on DSKY.

119. Set following controls on Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Switch Position	Signal
a.	1-2	IG&Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

120. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.

121. Enter VERB 36 into DSKY and press ENTR pushbutton.

121. Press EXECUTE pushbutton on Programmer and Monitor panel.

122. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of Channels 1, 2, and 3 to VARIABLE. Set FILTER switches to HI.

MANUAL LOAD PROCEDURES

IG STEP RESPONSE

123. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 and TB2-11 of TPA#2.

124. Press CHART SPEEDS 200 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 20 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 10 MV/MM.

125. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 3) of 20mm. Continue holding SERVO TEST switch to ON.

126. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

127. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

128. Determine and record the number of error signal oscillation peaks outside ±1mm of the final value. (See figure 3.) Record magnitude A. Record the time (t_f) for the error signal to reach and stay within 1mm of its final value.

MG STEP RESPONSE

129. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

CTS UPLINK TAPE LOAD PROCEDURES

IG STEP RESPONSE

MG STEP RESPONSE

129. Press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

CTS UPLINK TAPE LOAD PROCEDURES

129A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

129B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

129C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

129D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

130. Apply the 5V step input to MG TDA test input by removing jumper connected in step 123 and connecting it between TB5-18 and TB2-10 of TPA#2.

131. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 2 to 10 MV/MM.

132. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20mm. (Rotate PHASE ADJUST control as necessary if unable to obtain a 20mm pen deflection.) Continue holding SERVO TEST switch to ON.

133. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

MANUAL LOAD PROCEDURES

134. After observing a constant servo error on Channel 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

135. Determine and record the number of error signal oscillation peaks outside ±1mm of the final value. (See figure 3.) Record magnitude A. Record the time (t_1) for the error signal to reach and stay within 1mm of its final value.

OG STEP RESPONSE

136. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

137. Apply the 5V step input to OG TDA test input by removing jumper connected in step 130 and connecting it between TB5-18 and TB2-4 of TPA#2.

138. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 1 to 10 MV/MM

CTS UPLINK TAPE LOAD PROCEDURES

136. Press EXECUTE pushbutton on Programmer and Monitor panel.

136A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

136B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

136C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

136D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

b. CHANNEL 2 to 10 MV/MM

c. CHANNEL 3 to 20 MV/MM.

139. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 3 Oscillograph Amplifier to obtain a step input amplitude A (See figure 3) of 20mm. Continue holding SERVO TEST switch to ON.

140. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

141. After observing a constant servo error on Channel 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

142. Determine and record the number of error signal oscillation peaks outside ±1mm of the final value. (See Figure 3.) Record magnitude A. Record the time (t_1) for the error signal to reach and stay within 1mm of its final value.

NORMALIZATION OF SYSTEM

143. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR

NORMALIZATION OF SYSTEM

143. Press EXECUTE pushbutton on Programmer and Monitor panel.

143A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

143B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

143C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

144. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

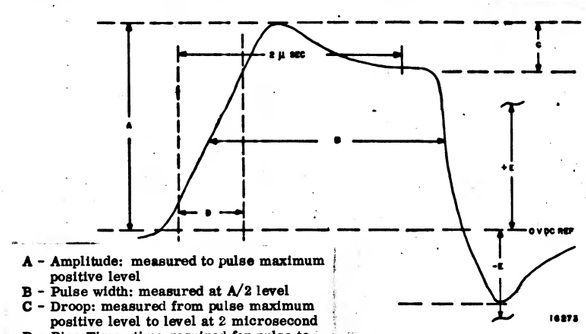
145. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

146. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

147. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RSET pushbutton on DSKY.

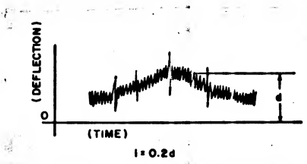
148. Press to extinguish SELF TEST pushbutton on Self Test panel.

149. Remove Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise; (No pulse)

Figure 1. Waveform Description



t = 0.2d
Where: 0.2 is Oscillograph sensitivity in volts per centimeter.
d is deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 2.

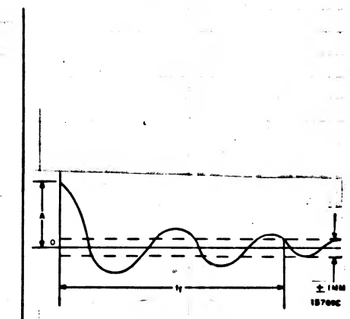


Figure 3.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

JDC NO. 12619 REV R
INITIAL TDRR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
9	PHASE GENERATOR 3200 CPS readout	deg					
15	PHASE GENERATOR 3200 CPS readout	deg					
17	PHASE GENERATOR 3200 CPS readout	deg					
24	IG error phase shift	deg					
27	IG error in-phase null	mv	-60		+60		
33	PHASE GENERATOR 3200 CPS readout	deg					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12619 REV R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	PHASE GENERATOR 3200 CPS readout	deg					
42	MG error phase shift	deg					
45	MG error in-phase null	mv	-60		+60		
51	PHASE GENERATOR 3200 CPS readout	deg					
53	PHASE GENERATOR 3200 CPS readout	deg					
60	OG error phase shift	deg					
63	OG error in-phase null	mv	-60		+60		
64.a	Total OG TDA	volts			10		
64.b	Total MG TDA	volts			10		
64.c	Total IG TDA	volts			10		
72	OG $-\Delta\theta$ abort	Refer to fig 1					
72.a.A	Amplitude	peak volts	4		10		
72.a.B	Pulse width	μsec	2		4		
72.a.C	Droop	volts			$\frac{A}{5}$		
72.a.D	Rise Time	μsec			0.5		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12619 REV R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
72.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
72.b	IRIG PVR	vdc					
72.c	IRIG Torque Current Monitor	vdc					
72.d	IRIG SF voltage	vdc					
79	OG $+\Delta\theta$ abort	Refer to fig 1					
79.A	Amplitude	peak volts	4		10		
79.B	Pulse width	μsec	2		4		
79.C	Droop	volts			$\frac{A}{5}$		
79.D	Rise Time	μsec			0.5		
79.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
80	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
80	OG TM Current CH4	amps	-0.125		+0.125		
80	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
90	IG $-\Delta\theta$ abort	Refer to fig 1					
90.A	Amplitude	peak volts	4		10		
90.B	Pulse width	μsec	2		4		
90.C	Droop	volts			$\frac{A}{5}$		

DATE _____

FORM 00147
Chg. 8-29-66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12619 REV R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
90.D	Rise Time	μsec			0.5		
90.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
97	IG $+\Delta\theta$ abort	Refer to fig 1					
97.A	Amplitude	peak volts	4		10		
97.B	Pulse width	μsec	2		4		
97.C	Droop	volts			$\frac{A}{5}$		
97.D	Rise Time	μsec			0.5		
97.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
98	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
98	IG TM Current on CH4	amps	-0.125		+0.125		
98	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
108	MG $-\Delta\theta$ abort	Refer to fig 1					
108.A	Amplitude	peak volts	4		10		
108.B	Pulse width	μsec	2		4		
108.C	Droop	volts			$\frac{A}{5}$		
108.D	Rise Time	μsec			0.5		

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EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12619
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
108.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
115	MG + $\Delta\theta$ abort	Refer to fig 1					
115.A	Amplitude	peak volts	4		10		
115.B	Pulse width	μsec	2		4		
115.C	Droop	volts			$\frac{A}{5}$		
115.D	Rise Time	μsec			0.5		
115.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
116	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
116	MG TM Current on CH4	amps	-0.125		+0.125		
116	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
128	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		
135	Oscillation peaks				3		
	Magnitude A	mm					
	t_f	ms			100		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12619
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
142	Oscillation peaks				5		
	Magnitude A	mm					
	t_f	ms			100		
	AGC Displays	All DSKY displays and indications reacted as specified					

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JOB GIMBAL RESPONSE TEST

JDC 12619 REV. - PAGE 1 OF 9
INITIAL TDRR _____ D.S. PGS 4
TDRR 27134 MAR 15 1966
ASSY.

SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slew periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA

REFERENCES PS 6015000

IMPORTANT See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. All starred (**) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.

2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

INITIALIZATION

1. Establish a MASTER INITIALIZATION condition.

2. Turn System on in accordance with applicable TURN-ON procedure.

3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.

5. Insure that the Inner, Middle and Outer gimbals are set to 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 20	Displayed
i. VERB 36		ENTR

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

Voltage	CROSSBAR CONTROL
a. OG Error Signal	133
b. MG Error Signal	134
c. IG Error Signal	135
d. X Gyro Error Signal	233
e. Z Gyro Error Signal	234

7. Set the Primary Signal Selector panel to monitor the following signals on the DVM. Record the indication of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138

-OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 37777		ENTR
m. VERB 22	NOUN 01	Flashing
n. 37777		ENTR

9. Place jumpers between the following points:

GSE	From	To
A1P	DIRECT PROBES OUTPUT	CH4DC
A1P	BUFFERED PROBES OUTPUT	CH5AC
A1P	J2F (OG-Δθ Abort)	SCOPE A IN
TPA#2	DIRECT PROBE	TB1-45 (hi) 49 (lo)
TPA#2	BUFFERED PROBE	TB2-35 (hi) 18 (lo)

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. OG CDU Fine Error on CHANNEL 3
b. OG TM current on CHANNEL 4
c. OG CDU Coarse Error on CHANNEL 5.

12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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13. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

a. Scope indications A through E (figure 1)
b. IRIG PVR (PIPA & IRIG SF Selector switch, position 10) on the Current Source Monitor per JDC 18016
c. IRIG Torque Current Monitor (PIPA & IRIG SF Selector switch, position 11) on the Current Source Monitor, JDC 18016
e. IRIG Scale Factor (PIPA & IRIG SF Selector switch, position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+OG FRICTION TEST

18. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405		ENTR
k. VERB 21	NOUN 01	Flashing
l. 40000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

22. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

DATE _____

23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-IG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41	NOUN 22	Displayed
b. VERB 24	NOUN 01	ENTR
c. 00407		ENTR
d. VERB 21	NOUN 01	Flashing
e. 37777		ENTR
f. VERB 22	NOUN 01	Flashing
g. 37777		ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1
b. IG TM Current on CHANNEL 4
c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

31. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

33. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

34. Measure and record the oscilloscope indications of A through E as represented on figure 1.

35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

36. Perform the following DSKY operations:

a. VERB 41	NOUN 22	Displayed
b. VERB 24	NOUN 01	ENTR
c. 00407		ENTR
d. VERB 21	NOUN 01	Flashing
e. 40000		ENTR
f. VERB 22	NOUN 01	Flashing
g. 40000		ENTR

37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A

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to monitor IG +Δθ abort signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

40. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

41. Measure and record the oscilloscope indications of A through E as represented on figure 1.

42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. +06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00411		ENTR
k. VERB 21	NOUN 01	Flashing
l. 14000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 00000		ENTR

44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.

45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.

46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.

47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

a. MG CDU Fine Error on CHANNEL 2
b. MG TM Current on CHANNEL 4
c. MG CDU Coarse Error on CHANNEL 5.

48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifiers as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM

50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

51. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.

52. Measure and record the oscilloscope indication of A through E as represented on figure 1.

53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. VERB 23	NOUN 22	Flashing
g. -06750		ENTR
h. VERB 41	NOUN 22	Displayed
i. VERB 42	NOUN 01	ENTR
j. 00411		ENTR
k. VERB 21	NOUN 01	Flashing
l. 54000		ENTR
m. VERB 22	NOUN 01	Flashing
n. 40000		ENTR

55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the scope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 2 to 5 MV/MM
b. CHANNEL 4 to 10 MV/MM
c. CHANNEL 5 to 50 MV/MM.

57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.

58. Perform the following DSKY operations:

VERB 42	ENTR
VERB 33	ENTR

NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.

59. Measure and record the oscilloscope indications of A through E as represented in figure 1.

60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and

record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 23	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

	CHANNEL Position	Signal
a.	1-2	IG & Y Gyro Error Signal
b.	2-2	MG Error Signal
c.	3-2	OG Error Signal

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM

66. Set the PHASE SHIFT SELECTOR on the phase sensitivie Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.

67. Connect a jumper between:

TPA #2	TB 5-27 and
TPA #2	TB 2-11

68. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 20	Displayed
i. VERB 36		ENTR

69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.

72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.

73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch

and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	50 MV/MM
c.	3	10 MV/MM

75. Remove the jumper of step 67 and connect as follows:

TPA #2	TP 5-18 and
TPA #2	TB 2-10

76. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 42	NOUN 22	Displayed
i. VERB 36		ENTR

77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.

80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

OG STEP RESPONSE

81. Set the following channel Sensitivities on the Oscillograph Amplifier panel:

	Channel	Sensitivity
a.	1	10 MV/MM
b.	2	10 MV/MM
c.	3	50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

TPA #2	TB 5-18 and
TPA #2	TB 2.4

83. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing

e. +00000 ENTR
f. Observe
VERB 23 NOUN 22 Flashing
g. +00000 ENTR
h. Observe
VERB 41 NOUN 20 Displayed
i. VERB 36 ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

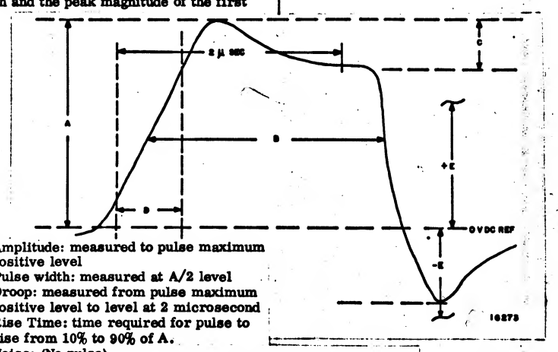
86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:
a. VERB 36 ENTR

89. Perform the following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe
VERB 23 NOUN 23 Flashing
g. +00000 ENTR



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microsecond
D - Rise Time: time required for pulse to rise from 10% to 90% of A.
E - Noise: (No pulse)

Figure 1. Waveform Description

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 4

JDC NO. 12619 REV. - INITIAL TDRR

JOB GIMBAL RESPONSE TEST TDRR 27134 MAR 15 1966

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE _____ START _____ END _____ SITE / LOCATION
SER. NO. _____ DWG _____ REV. _____	TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal**	mv			60		
6.b	MG Error signal**	mv			60		
6.c	IG Error signal**	mv			60		
6.d	X Gyro Error signal**	mv			60		
6.e	Z Gyro Error signal**	mv			60		
7.a	OG TDA	vdc			20 p-p		
7.b	MG TDA	vdc			20 p-p		
7.c	IG TDA	vdc			20 p-p		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 4

JDC NO. 12619 REV. -

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	5.94		6.06		
16.d	IRIG SF voltage	vdc	1.09		1.21		
23	OG +Δθ abort	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μ sec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μ sec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μ sec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μ sec			0.5		

DATE _____

FORM 091 7
Chg. 7-2[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 4

JDC NO. 12619 REV. -

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
41	IG +Δθ abort	Refer to fig 1					
41.A	Amplitude	peak volts	4		10		
41.B	Pulse width	μ sec	2		4		
41.C	Droop	volts			A/5		
41.D	Rise Time	μsec			0.5		
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070		
42	IG TM Current on CH4	vdc	-0.125		+0.125		
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
52	MG -Δθ abort	Refer to fig 1					
52.A	Amplitude	peak volts	4		10		
52.B	Pulse width	μsec	2		4		
52.C	Droop	volts			A/5		
52.D	Rise Time	μ sec			0.5		
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
59	MG + Δθ abort	Refer to fig 1					

DATE _____

FORM 091 7
Chg. 7-2[illegible]

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 4

JDC NO. 12619
REV. -

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
59.A	Amplitude	peak volts	4		10		
59.B	Pulse width	μ sec	2		4		
59.C	Droop	volts			A/5		
59.D	Rise Time	μsec			0.5		
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070		
60	MG TM Current on CH4	vdc	-0.125		+0.125		
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
73	IG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
80	MG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
87	OG stabilization loop response	sec	0		0.8		
	Number of over-shoots	number	0		2		
	AGC Displays	All DSKY displays and indications reacted as specified					

DATE _____

SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	8-24-67	34449	All	All	EA	-	PS 6015000 JDC 12614

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM LEM G & N SYSTEM
ASSY

7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on

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SUBSYSTEM LEM G & N SYSTEM
ASSY

Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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SUBSYSTEM LEM G & N SYSTEM
ASSY

Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR

*Parameters not available in LEM Operational SCA, P/N 6007013-011.

13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error (GG2107V)
CHANNEL 2 to 2	MG servo error (GG2137V)
CHANNEL 3 to 2	OG servo error (GG2167V)
CHANNEL 8 to 4	SCA GDB stepper switch

14. Insure that CH 3 AC indicator is lighted.

15. Set Phase Selector switch on demods to 3200 cps and zero oscillograph channels 1, 2, and 3. Following adjustments, set gains at 100 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input, by off-setting the zero line 12.5 mm to right of chart center line.

16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

17. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.1
FREQUENCY meter to 2.

Set the OSS channel 5 to 1 DC. Use the DC balance control on the Signal Generator to center the trace about zero reference on the Oscillograph.

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18. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

20. Press Gimbal Servo Test pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain an oscillograph trace of stabilization loop servo error data by performing the following steps for each test listed in table II.

a. Press TEST START pushbutton on the Test Selector panel. The pushbutton shall light.
b. Increase the Signal Generator amplitude to three-fourth of maximum for approximately 10 seconds, then return the control to 0.
c. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall extinguish.

22. Press the Gimbal Servo Test pushbutton on the Test Selector panel. The pushbutton shall extinguish.

23. Following completion of tests, set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input voltages monitored on channels 1, 2, and 3, and correlating peak-to-peak SCA output voltages monitored on channel 8.

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*Parameters not available in LEM Operational SCA, P/N 6007013-011

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.
b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.
c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.
d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.
e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000
f. Observe:
VERB 23 NOUN 23 Flashing
g. +00000

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. SITE LATITUDE VALUE from Table IV ENTR
k. VERB 33 ENTR
l. 00004 ENTR
m. 00001 ENTR

*Parameters not available in LEM Operational SCA, P/N 6007013-011.

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 21 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3 on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Record SCA input on PAVM and SCA output on DVM SIMULTANEOUSLY for each test.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*Parameters not available in LEM Operational SCA, P/N 6007013-011

*43. Perform the following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:
a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Set CROSSBAR CONTROL switches to position listed and record DVM indication.

*Parameters not available in LEM Operational SCA, P/N 6007013-011.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500
f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:
a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL

switches on Primary Signal Selector panel to position listed and record DVM indication.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing

e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR

*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

*60. Resolver Circuit Tester Preparation (RCT)

a. Set all decade error bridge switches and controls to OFF, minimum, or zero.
b. Connect cable W172 to GSE distribution box (GDB).
c. Connect RCT power cable to facility 115 vac power.
d. Connect jumper from decade error bridge (DEB) front panel output to DEB front panel switch.
e. Turn 800 reference input voltage switch from OFF to 26V. Power indicator shall light.
f. Set power on pushbutton indicator. Power ON, Read Mode and MON COARSE or MON FINE indicators shall light.
g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (Read rate table input and LORS rate table control) are de-energized.
h. Read Mode/Set Mode shall be placed in set mode position.
i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.
j. Determine that reference quadrant vernier dial is set to 0°, and reference quadrant dial to 0° -90° position.
k. Determine that decade degrees dials are set to 0°.
l. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating resolver CW, the 1X or coarse resolver is at one of its two nulls.
m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating the resolver CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the resolvers are rotated CW (increasing angle).
n. Select MON COARSE.
o. With the sensitivity fully CCW, set in the reference quadrant at 90° -180° and 90° on decade degrees dial.
p. Null meter using reference quadrant vernier control. Leave the reference quadrant vernier control in this position for all following tests.
q. Set reference quadrant dial to 0° -90° position.

*Parameters not available in LEM Operational SCA, P/N 6007013-011.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: PGNS caution lamp on the monitor panel will light during steps 64 through 73. Ignore lamp indication.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

75. Perform following DSKY operation:
VERB 36 ENTR

76. Set the following switches on the DEB and RCT control panel:
a. DEB - reference quadrant to 0° - 90°.
b. DEB - sensitivity to fully CCW.
c. RCT - perform step 60g.
d. RCT - set mode to lighted.
e. DEB - degrees to 45.000.

*Parameters not available in LEM Operational SCA, P/N 6007013-011.

f. RCT - MON COARSE to lighted.
g. RCT - resolver angle transmitter to 45.000.
h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.
i. DEB - set sensitivity to fully CCW.
j. RCT - MON FINE to lighted.
k. DEB - degrees to 0 + 00000.
l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.
m. DEB - sensitivity to fully CCW.
n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Monitor panel may light during step 86. Ignore lamp indication.

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (+10\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (+10\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (+10\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620
REV A
INITIAL TDRR 3:757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.75		28.25		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.23.a	IG Servo Error Channel 1	ΔV					
	IG Servo Error Channel 8	ΔV	Channel 1 -15%		Channel 1 +15%		
B.23.b	MG Servo Error Channel 2	ΔV					
	MG Servo Error Channel 8	ΔV	Channel 2 -15%		Channel 2 +15%		
B.23.c	OG Servo Error Channel 3	ΔV					
	OG Servo Error Channel 8	ΔV	Channel 3 -15%		Channel 3 +15%		
B.35.a	*IG TMC Channel 6	ΔV					
	*IG TMC Channel 8	ΔV	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	ΔV					
	*MG TMC Channel 8	ΔV	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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EQUIPMENT TEST
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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10°	VAC					
	*OG 1X Resolver Sin ±10°	VDC					
B.46.b	*MG 1X Resolver Sin ±10°	VAC					
	*MG 1X Resolver Sin ±10°	VDC					
B.46.c	*IG 1X Resolver Sin ±10°	VAC					
	*IG 1X Resolver Sin ±10°	VDC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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EQUIPMENT TEST
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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b (cont)	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 122)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JDC NO. 12620 REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBR 142)	VAC VDC	2.45		2.55		
B.67	*Shaft CDU Fine Error						

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JDC NO. 12620 REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

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JDC NO. 12620 REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC VDC					

CALCULATIONS

C.1

$$*\text{IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

$$*\text{MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

$$*\text{OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1\ (\pm 10\%)$$

C.2

$$*\text{OG 1X resolver sin } \pm 10^\circ = \frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

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EQUIPMENT TEST
DATA SHEET 13 OF 18

JDC NO. 12620 REV. A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC) (B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC) (B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC) (B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

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EQUIPMENT TEST
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JDC NO. 12620 REV. A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC) (B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC) (B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC) (B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC) (B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = 1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC) (B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = 1 (±10%)		

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EQUIPMENT TEST
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JDC NO. 12620 REV. A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC) (B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = 1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC) (B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC) (B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC) (B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC) (B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = 1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC) (B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = 1 (±10%)		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 16 OF 18

JDC NO. 12620 REV. A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC) (B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = 1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC) (B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = 1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC) (B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = 1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC) (B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = 1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC) (B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC) (B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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EQUIPMENT TEST
DATA SHEET 17 OF 18

JDC NO. 12620 REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (315°) = $\frac{8.5\ (\text{SCA output (VDC) (B.58.c)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)		
IG 1X resolver sin (315°) = $\frac{8.5\ (\text{SCA output (VDC)(B.58.d)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.58.d)}}$ = 1 (±10%)		
MG 1X resolver sin (315°) = $\frac{8.5\ (\text{SCA output (VDC)(B.58.e)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.58.e)}}$ = 1 (±10%)		
OG 1X resolver sin (315°) = $\frac{8.5\ (\text{SCA output (VDC) (B.58.f)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.58.f)}}$ = 1 (±10%)		
C.4		
Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)(B.89.a)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

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DATA SHEET 18 OF 18

JDC NO. 12620 REV A

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.4 (cont)		
Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)(B.89.b)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC) (B.89.c)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		

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DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013-011. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010-011.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

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off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR

*Not applicable to LEM Operational SCA, P/N 6007013-011.

13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error (GG2107V)
CHANNEL 2 to 2	MG servo error (GG2137V)
CHANNEL 3 to 2	OG servo error (GG2167V)
CHANNEL 8 to 4	SCA GDB stepper switch

14. Insure that CH 3 AC indicator is lighted.

15. Set Phase Selector switch on demods to 3200 cps and zero oscillograph channels 1, 2, and 3. Following adjustments, set gains at 100 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input, by off-setting the zero line 12.5 mm to right of chart center line.

16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

17. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.1
FREQUENCY meter to 2.

Set the OSS channel 5 to 1 DC. Use the DC balance control on the Signal Generator to center the trace about zero reference on the Oscillograph.

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18. Perform following DSKY operations:
   a. VERB 42 ENTR
   b. VERB 33 ENTR

19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

20. Press Gimbal Servo Test pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain an oscillograph trace of stabilization loop servo error data by performing the following steps for each test listed in table II.
   a. Press TEST START pushbutton on the Test Selector panel. The pushbutton shall light.
   b. Increase the Signal Generator amplitude to three-fourth of maximum for approximately 10 seconds, then return the control to 0.
   c. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall extinguish.

22. Press the Gimbal Servo Test pushbutton on the Test Selector panel. The pushbutton shall extinguish.

23. Following completion of tests, set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input voltages monitored on channels 1, 2, and 3, and correlating peak-to-peak SCA output voltages monitored on channel 8.

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*Not applicaboe to LEM Operational SCA, P/N 6007013-011.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.
   a. Connect PSA TPA Test Points to direct probes.
   b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.
   c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.
   d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.
   e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:
   a. VERB 41 NOUN 20 ENTR
   b. Observe:
      VERB 21 NOUN 22 Flashing
   c. +00000 ENTR
   d. Observe:
      VERB 22 NOUN 22 Flashing
   e. +00000
   f. Observe:
      VERB 23 NOUN 23 Flashing
   g. +00000

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 00370 ENTR
   c. 16002 ENTR
   d. VERB 57 ENTR
   e. 00003 ENTR
   f. Observe:
      VERB 06 NOUN 61 Flashing
   g. VERB 21 ENTR
   h. +00000 ENTR
   i. VERB 22 ENTR
   j. SITE LATITUDE VALUE from Table IV ENTR
   k. VERB 33 ENTR
   l. 00004 ENTR
   m. 00001 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013-011.

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

   n. Observe:
      VERB 21 NOUN 22 Flashing
   o. +00100 ENTR
   p. Observe:
      VERB 21 NOUN 22 Flashing
   q. +00100 ENTR
   r. Observe:
      VERB 23 NOUN 22 Flashing
   s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 02512 ENTR
   c. 00000 ENTR
   d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013-011.

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Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:
   a. VERB 21 NOUN 01 ENTR
   b. 02512 ENTR
   c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:
   a. VERB 41 NOUN 20 ENTR
   b. Observe:
      VERB 21 NOUN 22 Flashing
   c. +01000 ENTR
   d. Observe:
      VERB 22 NOUN 22 Flashing
   e. +01000 ENTR
   f. Observe:
      VERB 23 NOUN 22 Flashing
   g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:
   a. Set CROSSBAR CONTROL switches to 271.
   b. Set Test Selector panel to position listed and record DVM indication.
   c. Set CROSSBAR CONTROL switches to position listed and record DVM indication.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:
   a. VERB 41 NOUN 20 ENTR
   b. Observe:
      VERB 21 NOUN 22 Flashing
   c. +04500 ENTR
   d. Observe:
      VERB 22 NOUN 22 Flashing
   e. +04500

*Not applicable to LEM Operational SCA, P/N 6007013-011.

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR

*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all decade error bridge switches and controls to OFF, minimum or zero.
b. Connect cable W172 to GSE distribution box (GDB).
c. Connect RCT power cable to facility 115 vac power.
d. Connect jumper from decade error bridge (DEB) front panel output jacks to DEB front panel signal input jacks.
e. Turn 800 ~ reference input voltage switch on DEB from OFF to 26V. Power indicator shall light.
f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.
g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (Read rate table input and LORS rate table control) are de-energized.
h. Read Mode/Set Mode shall be placed in set mode position.
i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.
j. Determine that reference quadrant vernier dial is set to 0°, and reference quadrant dial to 0° -90° position.
k. Determine that decade degrees dials are set to 0°.
l. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating resolver CW, the 1X or coarse resolver is at one of its two nulls.
m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate resolver control and observe null meter. When null meter deflects right (+) while ro-

*Not applicable to LEM Operational SCA, P/N 6007013-011.

tating the resolver CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the resolvers are rotated CW (increasing angle).
n. Select MON COARSE.
o. With the sensitivity fully CCW, set in the reference quadrant at 90° -180° and 90° on decade degrees dial.
p. Null meter using reference quadrant vernier control. Leave the reference quadrant vernier control in this position for all following tests.
q. Set reference quadrant dial to 0° -90° position.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*Not applicable to LEM Operational SCA, P/N 6007013-011.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

75. Perform following DSKY operation:
VERB 36 ENTR

76. Set the following switches on the DEB and RCT control panel:
a. DEB - reference quadrant to 0° - 90°.
b. DEB - sensitivity to fully CCW.
c. RCT - perform step 60g.
d. RCT - set mode to lighted.
e. DEB - degrees to 45.000.
f. RCT - MON COARSE to lighted.
g. RCT - resolver angle transmitter to 45.000.
h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.
i. DEB - set sensitivity to fully CCW.
j. RCT - MON FINE to lighted.
k. DEB - degrees to 0 + 00000.
l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.
m. DEB - sensitivity to fully CCW.
n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

*Not applicable to LEM Operational SCA, P/N 6007013-011.

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Monitor panel may light during step 86. Ignore lamp indication.

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. $\text{IG CDU fine error} = \dfrac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. $\text{MG CDU fine error} = \dfrac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. $\text{OG CDU fine error} = \dfrac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. $\text{OG 1X resolver sin } \pm 10^\circ = \dfrac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. $\text{MG 1X resolver sin } \pm 10^\circ = \dfrac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. $\text{IG 1X resolver sin } \pm 10^\circ = \dfrac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. $\text{IG 1X resolver cos} = \dfrac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. $\text{MG 1X resolver cos} = \dfrac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. $\text{OG 1X resolver cos} = \dfrac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. $\text{IG 1X resolver sin} = \dfrac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. $\text{MG 1X resolver sin} = \dfrac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. $\text{OG 1X resolver sin} = \dfrac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. $\text{Yaw attitude error} = \dfrac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. $\text{Pitch attitude error} = \dfrac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. $\text{Roll attitude error} = \dfrac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b (cont)	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 122)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBR 142)	VAC VDC	 2.45		 2.55		
B.67	*Shaft CDU Fine Error						

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC VDC					

CALCULATIONS

C.1

$$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1\ (\pm 20\%)$$

C.2

$$\text{*OG 1X resolver sin} \pm 10^\circ = \frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = 1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = 1 (±10%)		

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = 1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = -1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = -1 (±10%)		

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EQUIPMENT TEST
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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = -1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = 1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = 1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = 1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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EQUIPMENT TEST
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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (315°) = $\frac{8.5\text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)		
IG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC)(B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)		
MG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC)(B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
OG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)		
C.4		
Yaw attitude error = $\frac{2.44\text{ (SCA output (VDC)(B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

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JDC NO. 12620 REV. B

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.4 (cont)		
Pitch attitude error = $\frac{2.44\text{ (SCA output (VDC)(B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{2.44\text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		

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SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013-011. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010-011.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

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off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe: VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe: VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe: VERB 23 NOUN 22 Flashing
h. +00000 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013-011.

13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error (GG2107V)
CHANNEL 2 to 2	MG servo error (GG2137V)
CHANNEL 3 to 2	OG servo error (GG2167V)
CHANNEL 8 to 4	SCA GDB stepper switch

14. Insure that CH 3 AC indicator is lighted.

15. Set Phase Selector switch on demods to 3200 cps and zero oscillograph channels 1, 2, and 3. Following adjustments, set gains at 100 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input, by off-setting the zero line 12.5 mm to right of chart center line.

16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

17. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.1
FREQUENCY meter to 2.

Set the OSS channel 5 to 1 DC. Use the DC balance control on the Signal Generator to center the trace about zero reference on the Oscillograph.

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18. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

20. Press Gimbal Servo Test pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain an oscillograph trace of stabilization loop servo error data by performing the following steps for each test listed in table II.
a. Press TEST START pushbutton on the Test Selector panel. The pushbutton shall light.
b. Increase the Signal Generator amplitude to three-fourth of maximum for approximately 10 seconds, then return the control to 0.
c. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall extinguish.

22. Press the Gimbal Servo Test pushbutton on the Test Selector panel. The pushbutton shall extinguish.

23. Following completion of tests, set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input voltages monitored on channels 1, 2, and 3, and correlating peak-to-peak SCA output voltages monitored on channel 8.

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*Not applicaboe to LEM Operational SCA, P/N 6007013-011.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.
a. Connect PSA TPA Test Points to direct probes.
b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.
c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.
d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.
e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000
f. Observe:
VERB 23 NOUN 23 Flashing
g. +00000

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. SITE LATITUDE VALUE from Table IV ENTR
k. VERB 33 ENTR
l. 00004 ENTR
m. 00001 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013-011.

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 21 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013-011.

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Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:
a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Set CROSSBAR CONTROL switches to position listed and record DVM indication.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500

*Not applicable to LEM Operational SCA, P/N 6007013-011.

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed and record DVM indication.
c. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR

*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all decade error bridge switches and controls to OFF, minimum or zero.
b. Connect cable W172 to G3E distribution box (GDB).
c. Connect RCT power cable to facility 115 vac power.

*Not applicable to LEM Operational SCA, P/N 6007013-011.

d. Connect jumper from decade error bridge (DEB) front panel output jacks to DEB front panel signal input jacks.
e. Turn 800 ~ reference input voltage switch on DEB from OFF to 26V. Power indicator shall light.
f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.
g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (Read rate table input and LORS rate table control) are de-energized.
h. Read Mode/Set Mode shall be placed in set mode position.
i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.
j. Determine that reference quadrant vernier dial is set to 0°, and reference quadrant dial to 0° -90° position.
k. Determine that decade degrees dials are set to 0°.
l. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating resolver CW, the 1X or coarse resolver is at one of its two nulls.
m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate resolver control and observe null meter. When null meter deflects right (+) while ro-

tating the resolver CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the resolvers are rotated CW (increasing angle).
n. Select MON COARSE.
o. With the sensitivity fully CCW, set in the reference quadrant at 90° -180° and 90° on decade degrees dial.
p. Null meter using reference quadrant vernier control. Leave the reference quadrant vernier control in this position for all following tests.
q. Set reference quadrant dial to 0° -90° position.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (lo).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*Not applicable to LEM Operational SCA, P/N 6007013-011.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

75. Perform following DSKY operations:
VERB 36 ENTR
VERB 40 NOUN 40 ENTR

76. Set the following switches on the DEB and RCT control panel:
a. DEB - reference quadrant to 0° - 90°.
b. DEB - sensitivity to fully CCW.
c. RCT - perform step 60g.
d. RCT - set mode to lighted.
e. DEB - degrees to 45.000.
f. RCT - MON COARSE to lighted.
g. RCT - resolver angle transmitter to 45.000.
h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.
i. DEB - set sensitivity to fully CCW.
j. RCT - MON FINE to lighted.
k. DEB - degrees to 0 + 00000.
l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.
m. DEB - sensitivity to fully CCW.
n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

*Not applicable to LEM Operational SCA, P/N 6007013-011.

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

NOTE: ISS warning lamp on Monitor panel may light during step 86. Ignore lamp indication.

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin $\pm 10^\circ$ = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin $\pm 10^\circ$ = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin $\pm 10^\circ$ = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620
REV C
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.00		29.00		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
REV C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.23.a	IG Servo Error Channel 1	V/PP					
	IG Servo Error Channel 8	V/PP	Channel 1 -15%		Channel 1 +15%		
B.23.b	MG Servo Error Channel 2	V/PP					
	MG Servo Error Channel 8	V/PP	Channel 2 -15%		Channel 2 +15%		
B.23.c	OG Servo Error Channel 3	V/PP					
	OG Servo Error Channel 8	V/PP	Channel 3 -15%		Channel 3 +15%		
B.35.a	*IG TMC Channel 6	V/PP					
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	V/PP					
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41.a	R & D 2.5 VDC Bias	VDC					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10°	VAC					
	*OG 1X Resolver Sin ±10°	VDC					
B.46.b	*MG 1X Resolver Sin ±10°	VAC					
	*MG 1X Resolver Sin ±10°	VDC					
B.46.c	*IG 1X Resolver Sin ±10°	VAC					
	*IG 1X Resolver Sin ±10°	VDC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b (cont)	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 122)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013-011

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBR 142)	VAC VDC	 2.45		 2.55		
B.67	*Shaft CDU Fine Error						

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC VDC					

CALCULATIONS

C.1

$$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1\ (\pm 20\%)$$

C.2

$$\text{*OG 1X resolver sin } \pm 10^\circ = \frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = $\frac{\text{2 (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 (±10%)		
*IG 1X resolver sin ±10° = $\frac{\text{2 (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = $\frac{\text{8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.a)}}$ = 1 (±10%)		
MG 1X resolver cos (45°) = $\frac{\text{8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.b)}}$ = 1 (±10%)		
OG 1X resolver cos (45°) = $\frac{\text{8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.c)}}$ = 1 (±10%)		

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = $\frac{\text{8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.d)}}$ = 1 (±10%)		
MG 1X resolver sin (45°) = $\frac{\text{8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.e)}}$ = 1 (±10%)		
OG 1X resolver sin (45°) = $\frac{\text{8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.f.)}}$ = 1 (±10%)		
IG 1X resolver cos (135°) = $\frac{\text{8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.a)}}$ = 1 (±10%)		
MG 1X resolver cos (135°) = $\frac{\text{8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.b)}}$ = 1 (±10%)		

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = $\frac{\text{8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.c)}}$ = 1 (±10%)		
IG 1X resolver sin (135°) = $\frac{\text{8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.d)}}$ = 1 (±10%)		
MG 1X resolver sin (135°) = $\frac{\text{8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.e)}}$ = 1 (±10%)		
OG 1X resolver sin (135°) = $\frac{\text{8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.f)}}$ = 1 (±10%)		
IG 1X resolver cos (225°) = $\frac{\text{8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.a)}}$ = -1 (±10%)		
MG 1X resolver cos (225°) = $\frac{\text{8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.b)}}$ = -1 (±10%)		

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = $\frac{\text{8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.c)}}$ = -1 (±10%)		
IG 1X resolver sin (225°) = $\frac{\text{8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.d)}}$ = 1 (±10%)		
MG 1X resolver sin (225°) = $\frac{\text{8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.e)}}$ = 1 (±10%)		
OG 1X resolver sin (225°) = $\frac{\text{8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.f)}}$ = 1 (±10%)		
IG 1X resolver cos (315°) = $\frac{\text{8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.a)}}$ = 1 (±10%)		
MG 1X resolver cos (315°) = $\frac{\text{8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.b)}}$ = 1 (±10%)		

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont) OG 1X resolver cos (315°) = $\frac{\text{8.5 (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)		
IG 1X resolver sin (315°) = $\frac{\text{8.5 (SCA output (VDC)(B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)		
MG 1X resolver sin (315°) = $\frac{\text{8.5 (SCA output (VDC)(B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
OG 1X resolver sin (315°) = $\frac{\text{8.5 (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)		
C.4 Yaw attitude error = $\frac{\text{2.44 (SCA output (VDC)(B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

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CALCULATIONS	REJ	ACC
C.4 (cont) Pitch attitude error = $\frac{\text{2.44 (SCA output (VDC)(B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{\text{2.44 (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		

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SUBSYSTEM LEM G & N SYSTEM ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

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off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36		ENTR
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000		ENTR
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000		ENTR
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000		ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

13. Deleted

14. Deleted

15. Deleted

16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01
FREQUENCY meter to 6.0
FUNCTION to SQUARE
DC BALANCE to midposition
AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

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b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	137	IG servo error	135
b	2	138	MG servo error	134
c	3	139	OG servo error	133

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes. _____

*Not applicable to LEM Operational SCA, P/N 6007013.

b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8. _____

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +00000

f. Observe:
VERB 23 NOUN 23 Flashing

g. +00000

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00370 ENTR

c. 16002 ENTR

d. VERB 57 ENTR

e. 00003 ENTR

f. Observe:
VERB 06 NOUN 61 Flashing

g. VERB 21 ENTR

h. +00000 ENTR

i. VERB 22 ENTR

j. SITE LATITUDE VALUE from Table IV ENTR

k. VERB 33 ENTR

l. 00004 ENTR

m. 00001 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing

o. +00100 ENTR

p. Observe:
VERB 21 NOUN 22 Flashing

q. +00100 ENTR

r. Observe:
VERB 23 NOUN 22 Flashing

s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013.

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Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +01000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.

c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +04500

*Not applicable to LEM Operational SCA, P/N 6007013

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.

c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all decade error bridge switches and controls to OFF, minimum or zero.

b. Connect cable W172 to GSE distribution box (GDB).

c. Connect RCT power cable to facility 115 vac power.

*Not applicable to LEM Operational SCA, P/N 6007013

d. Connect jumper from decade error bridge (DEB) front panel output jacks to DEB front panel signal input jacks.

e. Turn 800 ~ reference input voltage switch on DEB from OFF to 26V. Power indicator shall light.

f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.

g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (Read rate table input and LORS rate table control) are de-energized.

h. Read Mode/Set Mode shall be placed in set mode position.

i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.

j. Determine that reference quadrant vernier dial is set to 0°, and reference quadrant dial to 0° -90° position.

k. Determine that decade degrees dials are set to 0°.

l. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating resolver CW, the 1X or coarse resolver is at one of its two nulls.

m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate resolver control and observe null meter. When null meter deflects right (+) while ro-

tating the resolver CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the resolvers are rotated CW (increasing angle).

n. Select MON COARSE.

o. With the sensitivity fully CCW, set in the reference quadrant at 90° -180° and 90° on decade degrees dial.

p. Null meter using reference quadrant vernier control. Leave the reference quadrant vernier control in this position for all following tests.

q. Set reference quadrant dial to 0° -90° position.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*Not applicable to LEM Operational SCA, P/N 6007013.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

75. Perform following DSKY operations:
VERB 36 ENTR
VERB 40 NOUN 40 ENTR

76. Set the following switches on the DEB and RCT control panel:

a. DEB - reference quadrant to 0° - 90°.

b. DEB - sensitivity to fully CCW.

c. RCT - perform step 60g.

d. RCT - set mode to lighted.

e. DEB - degrees to 45.000.

f. RCT - MON COARSE to lighted.

g. RCT - resolver angle transmitter to 45.000.

h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.

i. DEB - set sensitivity to fully CCW.

j. RCT - MON FINE to lighted.

k. DEB - degrees to 0 + 00000.

l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.

m. DEB - sensitivity to fully CCW.

n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

*Not applicable to LEM Operational SCA, P/N 6007013.

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR
NOTE: BS warning lamp on Monitor panel may light during step 86. Ignore lamp indication.

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

b. MG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

c. OG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620 REV D INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.00		29.00		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 18

JDC NO. 12620 REV D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.21	IG Servo Error SCA input (Test a)	VAC					
	IG Servo Error SCA output (Test a)	VDC					
	MG Servo Error SCA input (Test b)	VAC					
	MG Servo Error SCA output (Test b)	VDC					
	OG Servo Error SCA input (Test c)	VAC					
	OG Servo Error SCA output (Test c)	VDC					
B.35.a	*IG TMC Channel 6	V/PP					
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	V/PP					
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013

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EQUIPMENT TEST
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JDC NO. 12620 REV D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41.a	R & D 2.5 VDC Bias	VDC					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10°	VAC					
	*OG 1X Resolver Sin ±10°	VDC					
B.46.b	*MG 1X Resolver Sin ±10°	VAC					
	*MG 1X Resolver Sin ±10°	VDC					
B.46.c	*IG 1X Resolver Sin ±10°	VAC					
	*IG 1X Resolver Sin ±10°	VDC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b (cont)	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 122)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

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JDC NO. 12620
REV D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

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EQUIPMENT TEST
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JDC NO. 12620
REV D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

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JDC NO. 12620
REV D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBAR 142)	VAC					
B.67	*Shaft CDU Fine Error	VDC	2.45		2.55		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM)	VAC					
	Roll Attitude Error (DVM) (TES 116)	VDC					

CALCULATIONS

C.1

$$*\text{IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$*\text{MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$*\text{OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1\ (\pm 20\%)$$

C.2

$$*\text{OG 1X resolver sin } \pm 10^\circ = \frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = -1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = -1 (±10%)		

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = -1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = -1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = -1 (±10%)		

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = -1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = -1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = -1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = -1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont) OG 1X resolver cos (315°) = 8.5 (SCA output (VDC) (B.58.c) -2.5V PCM bias) / SCA input (VAC) (B.58.c) = 1 (±10%)		
IG 1X resolver sin (315°) = 8.5 (SCA output (VDC)(B.58.d) -2.5V PCM bias) / SCA input (VAC) (B.58.d) = -1 (±10%)		
MG 1X resolver sin (315°) = 8.5 (SCA output (VDC)(B.58.e) -2.5V PCM bias) / SCA input (VAC) (B.58.e) = -1 (±10%)		
OG 1X resolver sin (315°) = 8.5 (SCA output (VDC) (B.58.f) -2.5V PCM bias) / SCA input (VAC) (B.58.f) = -1 (±10%)		
C.4 Yaw attitude error = 2.44 (SCA output (VDC)(B.89.a) -2.5V PCM bias) / SCA input (VAC) (B.89.a) = 1 (±10%)		

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JDC NO. 12620 REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.4 (cont) Pitch attitude error = 2.44 (SCA output (VDC)(B.89.b) -2.5V PCM bias) / SCA input (VAC) (B.89.b) = 1 (±10%)		
Roll attitude error = 2.44 (SCA output (VDC) (B.89.c) -2.5V PCM bias) / SCA input (VAC) (B.89.c) = 1 (±10%)		
C.5 IG servo error = SCA output (VDC) (B.21 test a) / SCA input (VAC) (B.21 test a) = 0.91 (±15%)		
MG servo error = SCA output (VDC) (B.21 test b) / SCA input (VAC) (B.21 test b) = 0.91 (±15%)		
OG servo error = SCA output (VDC) (B.21 test c) / SCA input (VAC) (B.21 test c) = 0.91 (±15%)		

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SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A. 7. If installation is required, proceed with step A. 1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

Test Selector Panel Position		
*135	Cal. Mod. Temperature (GG6020T)	
*145	R & D 2.5 vdc bias (GG1111V)	
*150	IMU Heater Current (GG2302X)	
201	PIPA Temperature (GG2300T)	
*202	IRIG Temperature (GG2301T)	
103	120 vdc Reference (GG1040V)	
104	2.5 vdc PCM bias (GG1110V)	
106	3200 cps 28 volt supply (GG1331V)	
113	800 cps 28 volt supply (GG1201V)	

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe: VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe: VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe: VERB 23 NOUN 22 Flashing
h. +00000 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

13. Deleted
14. Deleted
15. Deleted
16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01
FREQUENCY meter to 6.0
FUNCTION to SQUARE
DC BALANCE to midposition
AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	137	IG servo error	135
b	2	138	MG servo error	134
c	3	139	OG servo error	133

*Not applicable to LEM Operational SCA, P/N 6007013.

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.

b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000
f. Observe:
VERB 23 NOUN 23 Flashing
g. +00000

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. SITE LATITUDE VALUE from Table IV ENTR
k. VERB 33 ENTR
l. 00004 ENTR
m. 00001 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 21 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013.

FORM 00145
Chg. 7-23-65

Table V

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.
c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500

*Not applicable to LEM Operational SCA, P/N 6007013

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.

c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all decade error bridge switches and controls to OFF, minimum or zero.

b. Connect cable W172 to GSE distribution box (GDB).

c. Connect RCT power cable to facility 115 vac power.

*Not applicable to LEM Operational SCA, P/N 6007013

d. Connect jumper from decade error bridge (DEB) front panel output jacks to DEB front panel signal input jacks.

e. Turn 800 ~ reference input voltage switch on DEB from OFF to 26V. Power indicator shall light.

f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.

g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (Read rate table input and LORS rate table control) are de-energized.

h. Read Mode/Set Mode shall be placed in set mode position.

i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.

j. Determine that reference quadrant vernier dial is set to 0°, and reference quadrant dial to 0° -90° position.

k. Determine that decade degrees dials are set to 0°.

l. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating resolver CW, the 1X or coarse resolver is at one of its two nulls.

m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate resolver control and observe null meter. When null meter deflects right (+) while ro-

tating the resolver CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the resolvers are rotated CW (increasing angle).

n. Select MON COARSE.

o. With the sensitivity fully CCW, set in the reference quadrant at 90° -180° and 90° on decade degrees dial.

p. Null meter using reference quadrant vernier control. Leave the reference quadrant vernier control in this position for all following tests.

q. Set reference quadrant dial to 0° -90° position.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*Not applicable to LEM Operational SCA, P/N 6007013.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on the Monitor panel and PROG alarm lamp on the DSKY will light during performance of steps 75 through 85. Ignore the lamp indications.

75. Perform following DSKY operations:
VERB 36 ENTR
VERB 40 NOUN 40 ENTR

76. Set the following switches on the DEB and RCT control panel:

a. DEB - reference quadrant to 0° - 90°.

b. DEB - sensitivity to fully CCW.

c. RCT - perform step 60g.

d. RCT - set mode to lighted.

e. DEB - degrees to 45.000.

f. RCT - MON COARSE to lighted.

g. RCT - resolver angle transmitter to 45.000.

h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.

i. DEB - set sensitivity to fully CCW.

j. RCT - MON FINE to lighted.

k. DEB - degrees to 0 + 00000.

l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.

m. DEB - sensitivity to fully CCW.

n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA

*Not applicable to LEM Operational SCA, P/N 6007013.

output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during step 86. Ignore lamp indication.

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

b. MG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

c. OG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620
REV E
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.00		29.00		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 18

JDC NO. 12620
REV E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.21	IG Servo Error SCA input (Test a)	VAC					
	IG Servo Error SCA output (Test a)	VDC					
	MG Servo Error SCA input (Test b)	VAC					
	MG Servo Error SCA output (Test b)	VDC					
	OG Servo Error SCA input (Test c)	VAC					
	OG Servo Error SCA output (Test c)	VDC					
B.35.a	*IG TMC Channel 6	V/PP					
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	V/PP					
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 18

JDC NO. 12620
REV E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41.a	*R & D 2.5 VDC Bias	VDC					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 18

JDC NO. 12620
REV E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10°	VAC					
	*OG 1X Resolver Sin ±10°	VDC					
B.46.b	*MG 1X Resolver Sin ±10°	VAC					
	*MG 1X Resolver Sin ±10°	VDC					
B.46.c	*IG 1X Resolver Sin ±10°	VAC					
	*IG 1X Resolver Sin ±10°	VDC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b (cont)	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 122)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG IX Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBAR 142)	VAC					
B.67	*Shaft CDU Fine Error	VDC	2.45		2.55		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM)	VAC					
	Roll Attitude Error (DVM) (TES 116)	VDC					

CALCULATIONS

C.1

$$*\text{IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$*\text{MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$$

$$*\text{OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1\ (\pm 20\%)$$

C.2

$$*\text{OG 1X resolver sin} \pm 10^\circ = \frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$$

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) -2.5V PCM bias) / SCA input (VAC) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = -1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = -1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = -1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = -1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = -1 (±10%)		

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JDC NO. 12620 REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = -1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = -1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = -1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = -1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (315°) = $\frac{8.5\text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)		
IG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC)(B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)		
MG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC)(B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
OG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)		
C.4		
Yaw attitude error = $\frac{2.44\text{ (SCA output (VDC)(B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.4 (cont)		
Pitch attitude error = $\frac{2.44\text{ (SCA output (VDC)(B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{2.44\text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		
C.5		
IG servo error = $\frac{\text{SCA output (VDC) (B.21 test a)}}{\text{SCA input (VAC) (B.21 test a)}}$ = 0.91 (±15%)		
MG servo error = $\frac{\text{SCA output (VDC) (B.21 test b)}}{\text{SCA input (VAC) (B.21 test b)}}$ = 0.91 (±15%)		
OG servo error = $\frac{\text{SCA output (VDC) (B.21 test c)}}{\text{SCA input (VAC) (B.21 test c)}}$ = 0.91 (±15%)		

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SUBSYSTEM LEM G & N SYSTEM
ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	5-24-67	34449	All	All	EA	-
B	6-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-
F	3-28-68	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY

7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set PHASE SHIFT SELECTOR switch on demods to VARIABLE and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA TEST TMC INHIBIT indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that the above inhibit indicator extinguishes.

Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe: VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe: VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe: VERB 23 NOUN 22 Flashing
h. +00000 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

13. Deleted
14. Deleted
15. Deleted
16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01
FREQUENCY meter to 6.0
FUNCTION to SQUARE
DC BALANCE to midposition
AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	137	IG servo error	135
b	2	138	MG servo error	134
c	3	139	OG servo error	133

*Not applicable to LEM Operational SCA, P/N 6007013.

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.

b. Set Test Selector CROSSBAR and GIMBAL SERVO TEST switch as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator AMPLITUDE control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press TEST STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00370 ENTR

c. 16002 ENTR

d. VERB 57 ENTR

e. 00003 ENTR

f. Observe:
VERB 06 NOUN 61 Flashing

g. VERB 21 ENTR

h. +00000 ENTR

i. VERB 22 ENTR

j. SITE LATITUDE VALUE from Table IV ENTR

k. VERB 33 ENTR

l. 00004 ENTR

m. 00001 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing

o. +00100 ENTR

p. Observe:
VERB 22 NOUN 22 Flashing

q. +00100 ENTR

r. Observe:
VERB 23 NOUN 22 Flashing

s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +01000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.

c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +04500 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.

c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all Decade Error Bridge switches and controls to OFF, minimum or zero.

b. Connect cable W172 to GSE distribution box (GDB).

c. Connect RCT power cable to facility 115 vac power.

d. Connect jumper from Decade Error Bridge (DEB) front panel OUTPUT jacks to DEB front panel SIGNAL INPUT jacks.

e. Turn 800~ REFERENCE INPUT VOLTAGE switch on DEB from OFF to 26V. POWER indicator shall light.

f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.

g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (READ RATE TABLE INPUT and LORS RATE TABLE CONTROL) are deenergized.

h. READ MODE/SET MODE shall be placed in SET MODE position.

i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.

j. Determine that REFERENCE QUADRANT VERNIER dial is set to 0°, and REFERENCE QUADRANT switch is set to 0° - 90°.

k. Determine that DEB DEGREES dials are set to 0°.

l. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating RESOLVER ANGLE TRANSMITTER control CW, the 1X or coarse resolver is at one of its two nulls.

m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating

*Not applicable to LEM Operational SCA, P/N 6007013

the RESOLVER ANGLE TRANSMITTER control CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the RESOLVER ANGLE TRANSMITTER control is rotated CW (increasing angle).

n. Select MON COARSE.

o. With the SENSITIVITY control fully CCW, set the REFERENCE QUADRANT switch to 90° - 180° and set DEB DEGREES dials to 90°.

p. Null meter using REFERENCE QUADRANT VERNIER control. Leave the REFERENCE QUADRANT VERNIER control in this position for all following tests.

q. Set REFERENCE QUADRANT switch to 0° - 90°.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*Not applicable to LEM Operational SCA, P/N 6007013.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on the Monitor panel and PROG alarm lamp on the DSKY will light during performance of steps 75 through 85. Ignore the lamp indications.

75. Perform following DSKY operations:
VERB 36 ENTR
VERB 40 NOUN 40 ENTR

76. Set the following switches on the DEB and RCT control panel:

a. DEB - REFERENCE QUADRANT to 0° - 90°.

b. DEB - SENSITIVITY to fully CCW.

c. RCT - perform step 60g.

d. RCT - SET MODE to lighted.

e. DEB - DEGREES to 45.000.

f. RCT - MON COARSE to lighted.

g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.

h. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive coarse scale.

i. DEB - SENSITIVITY to fully CCW.

j. RCT - MON FINE to lighted.

k. DEB - DEGREES to 0 + 00000.

l. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive fine scale.

m. DEB - SENSITIVITY to fully CCW.

n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA

*Not applicable to LEM Operational SCA, P/N 6007013.

output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800~ REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during step 86. Ignore lamp indication.

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

b. MG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

c. OG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620
REV F
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME / AFFILIATION APPROVED BY _____ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.00		29.00		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 18

JDC NO. 12620
REV F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.21	IG Servo Error SCA input (Test a)	VAC					
	IG Servo Error SCA output (Test a)	VDC					
	MG Servo Error SCA input (Test b)	VAC					
	MG Servo Error SCA output (Test b)	VDC					
	OG Servo Error SCA input (Test c)	VAC					
	OG Servo Error SCA output (Test c)	VDC					
B.35.a	*IG TMC Channel 6	V/PP					
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	V/PP					
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 18

JDC NO. 12620
REV F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41.a	*R & D 2.5 VDC Bias	VDC					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 18

JDC NO. 12620
REV F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10° (Test A) (TES 203)	VDC					
	*OG 1X Resolver Sin ±10° (Test A) (XBR 142)	VAC					
B.46.b	*IG 1X Resolver Sin ±10° (Test B) (TES 204)	VDC					
	*IG 1X Resolver Sin ±10° (Test B) (XBR 144)	VAC					
B.46.c	*MG 1X Resolver Sin ±10° (Test C) (TES 205)	VDC					
	*MG 1X Resolver Sin ±10° (Test C) (XBR 143)	VAC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 18

JDC NO. 12620 REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

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JDC NO. 12620 REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

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JDC NO. 12620 REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

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JDC NO. 12620 REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBAR 142)	VAC					
B.67	*Shaft CDU Fine Error	VDC	2.45		2.55		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM)	VAC					
	Roll Attitude Error (DVM) (TES 116)	VDC					

CALCULATIONS

C.1

$$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.a)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.a)}} = 1\ (\pm 20\%)$$

$$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.b)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.b)}} = 1\ (\pm 20\%)$$

$$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.c)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.c)}} = 1\ (\pm 20\%)$$

C.2

$$\text{*OG1X resolver sin} \pm 10^\circ = \frac{2\ (\text{SCA output (VDC) (B.46.a)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.46.a)}} = 1\ (\pm 10\%)$$

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) (B.46.c) -2.5V PCM bias) / SCA input (VAC) (B.46.c) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) (B.46.b) -2.5V PCM bias) / SCA input (VAC) (B.46.b) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = -1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = -1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = -1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = -1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = -1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = -1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = -1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = -1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = -1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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CALCULATIONS	REJ	ACC
C.3 (cont) OG 1X resolver cos (315°) = $\frac{8.5\text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)		
IG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC)(B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)		
MG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC)(B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
OG 1X resolver sin (315°) = $\frac{8.5\text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)		
C.4 Yaw attitude error = $\frac{2.44\text{ (SCA output (VDC)(B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

CALCULATIONS	REJ	ACC
C.4 (cont) Pitch attitude error = $\frac{2.44\text{ (SCA output (VDC)(B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{2.44\text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		
C.5 IG servo error = $\frac{\text{SCA output (VDC) (B.21 test a)}}{\text{SCA input (VAC) (B.21 test a)}}$ = 0.91 (±15%)		
MG servo error = $\frac{\text{SCA output (VDC) (B.21 test b)}}{\text{SCA input (VAC) (B.21 test b)}}$ = 0.91 (±15%)		
OG servo error = $\frac{\text{SCA output (VDC) (B.21 test c)}}{\text{SCA input (VAC) (B.21 test c)}}$ = 0.91 (±15%)		

SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-
F	3-28-68	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA	-
G	7-25-68	36586	1, 9, 10, 12	-	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

NOTE: If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set PHASE SHIFT SELECTOR switch on demods to VARIABLE and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA TEST TMC INHIBIT indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that the above inhibit indicator extinguishes.

Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe: VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe: VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe: VERB 23 NOUN 22 Flashing
h. +00000 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

13. Deleted
14. Deleted
15. Deleted
16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01
FREQUENCY meter to 6.0
FUNCTION to SQUARE
DC BALANCE to midposition
AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	137	IG servo error	135
b	2	138	MG servo error	134
c	3	139	OG servo error	133

*Not applicable to LEM Operational SCA, P/N 6007013.

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBE 3 OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall light.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.

b. Set Test Selector CROSSBAR and GIMBAL SERVO TEST switch as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator AMPLITUDE control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press TEST STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*37. Connect jumper between PROBE 3 OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. SITE LATITUDE VALUE from Table IV ENTR
k. VERB 33 ENTR
l. 00004 ENTR
m. 00001 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013.

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 22 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013.

FORM 00145
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Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.
c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.
c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. Observe:
GIMBAL LOCK lamp is lighted.
i. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR

b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all Decade Error Bridge switches and controls to OFF, minimum or zero.
b. Connect cable W172 to GSE distribution box (GDB).
c. Connect RCT power cable to facility 115 vac power.
d. Connect jumper from Decade Error Bridge (DEB) front panel OUTPUT jacks to DEB front panel SIGNAL INPUT jacks.
e. Turn 800~ REFERENCE INPUT VOLTAGE switch on DEB from OFF to 26V. POWER indicator shall light.
f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.
g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (READ RATE TABLE INPUT and LORS RATE TABLE CONTROL) are deenergized.
h. READ MODE/SET MODE shall be placed in SET MODE position.
i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.
j. Determine that REFERENCE QUADRANT VERNIER dial is set to 0°, and REFERENCE QUADRANT switch is set to 0° - 90°.
k. Determine that DEB DEGREES dials are set to 0°.
l. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating RESOLVER ANGLE TRANSMITTER control CW, the 1X or coarse resolver is at one of its two nulls.
m. Press MON FINE pushbutton. MON

FINE indicator lights. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating the RESOLVER ANGLE TRANSMITTER control CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the RESOLVER ANGLE TRANSMITTER control is rotated CW (increasing angle).

n. Select MON COARSE.
o. With the SENSITIVITY control fully CCW, set the REFERENCE QUADRANT switch to 90° - 180° and set DEB DEGREES dials to 90°.
p. Null meter using REFERENCE QUADRANT VERNIER control. Leave the REFERENCE QUADRANT VERNIER control in this position for all following tests.
q. Set REFERENCE QUADRANT switch to 0° - 90°.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*Not applicable to LEM Operational SCA, P/N 6007013.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on the Monitor panel and PROG alarm lamp on the DSKY will light during performance of steps 75 through 85. Ignore the lamp indications.

75. Perform following DSKY operations:
VERB 36 ENTR
VERB 40 NOUN 40 ENTR

76. Set the following switches on the DEB and RCT control panel:

a. DEB - REFERENCE QUADRANT to 0° - 90°.
b. DEB - SENSITIVITY to fully CCW.
c. RCT - perform step 60g.
d. RCT - SET MODE to lighted.
e. DEB - DEGREES to 45.000.
f. RCT - MON COARSE to lighted.
g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.
h. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive coarse scale.
i. DEB - SENSITIVITY to fully CCW.
j. RCT - MON FINE to lighted.
k. DEB - DEGREES to 0 + 00000.
l. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive fine scale.
m. DEB - SENSITIVITY to fully CCW.
n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_2 is approximately 00000.

78A. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

*Not applicable to LEM Operational SCA, P/N 6007013.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800~ REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during step 86. Ignore lamp indication.

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing

d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

b. MG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

c. OG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620
REV G
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.00		29.00		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 18

JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.21	IG Servo Error SCA input (Test a)	VAC					
	IG Servo Error SCA output (Test a)	VDC					
	MG Servo Error SCA input (Test b)	VAC					
	MG Servo Error SCA output (Test b)	VDC					
	OG Servo Error SCA input (Test c)	VAC					
	OG Servo Error SCA output (Test c)	VDC					
B.35.a	*IG TMC Channel 6	V/PP					
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	V/PP					
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 18

JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41.a	*R & D 2.5 VDC Bias	VDC					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 18

JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10° (Test A) (TES 203)	VDC					
	*OG 1X Resolver Sin ±10° (Test A) (XBR 142)	VAC					
B.46.b	*IG 1X Resolver Sin ±10° (Test B) (TES 204)	VDC					
	*IG 1X Resolver Sin ±10° (Test B) (XBR 144)	VAC					
B.46.c	*MG 1X Resolver Sin ±10° (Test C) (TES 205)	VDC					
	*MG 1X Resolver Sin ±10° (Test C) (XBR 143)	VAC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 18

JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

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JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

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JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

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JDC NO. 12620
REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

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JDC NO. 12620 REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JDC NO. 12620 REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBAR 142)	VAC					
B.67	*Shaft CDU Fine Error	VDC	2.45		2.55		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM)	VAC					
	Roll Attitude Error (DVM) (TES 116)	VDC					

CALCULATIONS

C.1

$$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.a)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.a)}} = 1\ (\pm 20\%)$$

$$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.b)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.b)}} = 1\ (\pm 20\%)$$

$$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.c)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.c)}} = 1\ (\pm 20\%)$$

C.2

$$\text{*OG1X resolver sin} \pm 10° = \frac{2\ (\text{SCA output (VDC) (B.46.a)} - 2.5\text{V DCM bias})}{\text{SCA input (VAC) (B.46.a)}} = 1\ (\pm 10\%)$$

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. C

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) (B.46.c) -2.5V PCM bias) / SCA input (VAC) (B.46.c) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) (B.46.b) -2.5V PCM bias) / SCA input (VAC) (B.46.b) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC NO. 12620 REV. G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = -1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = -1 (±10%)		

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JDC NO. 12620 REV. G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = -1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = -1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = -1 (±10%)		

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JDC NO. 12620 REV. G

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = -1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = -1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = -1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = -1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont) OG 1X resolver cos (315°) = 8.5 (SCA output (VDC) (B.58.c) -2.5V PCM bias) / SCA input (VAC) (B.58.c) = 1 (±10%)		
IG 1X resolver sin (315°) = 8.5 (SCA output (VDC)(B.58.d) -2.5V PCM bias) / SCA input (VAC) (B.58.d) = -1 (±10%)		
MG 1X resolver sin (315°) = 8.5 (SCA output (VDC)(B.58.e) -2.5V PCM bias) / SCA input (VAC) (B.58.e) = -1 (±10%)		
OG 1X resolver sin (315°) = 8.5 (SCA output (VDC) (B.58.f) -2.5V PCM bias) / SCA input (VAC) (B.58.f) = -1 (±10%)		
C.4 Yaw attitude error = 2.44 (SCA output (VDC)(B.89.a) -2.5V PCM bias) / SCA input (VAC) (B.89.a) = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.4 (cont) Pitch attitude error = 2.44 (SCA output (VDC)(B.89.b) -2.5V PCM bias) / SCA input (VAC) (B.89.b) = 1 (±10%)		
Roll attitude error = 2.44 (SCA output (VDC) (B.89.c) -2.5V PCM bias) / SCA input (VAC) (B.89.c) = 1 (±10%)		
C.5 IG servo error = SCA output (VDC) (B.21 test a) / SCA input (VAC) (B.21 test a) = 0.91 (±15%)		
MG servo error = SCA output (VDC) (B.21 test b) / SCA input (VAC) (B.21 test b) = 0.91 (±15%)		
OG servo error = SCA output (VDC) (B.21 test c) / SCA input (VAC) (B.21 test c) = 0.91 (±15%)		

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DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-
F	3-28-68	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA	-
G	7-25-68	36586	1, 9, 10, 12	-	EA	-
H	9-26-68	36861	1	-	EA	-

REFERENCES
PS 6015000
JDC 12614

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010. 3. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

NOTE: If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining

parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TB1-29 (hi) and TB5-22 (lo).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position	Voltage
101	28 vdc LGC operate (GG1523X)
102	28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set PHASE SHIFT SELECTOR switch on demods to VARIABLE and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA TEST TMC INHIBIT indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these

positions, push SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that the above inhibit indicator extinguishes.

Test Selector Panel Position	
*135	Cal. Mod. Temperature (GG6020T)
*145	R & D 2.5 vdc bias (GG1111V)
*150	IMU Heater Current (GG2302X)
201	PIPA Temperature (GG2300T)
*202	IRIG Temperature (GG2301T)
103	120 vdc Reference (GG1040V)
104	2.5 vdc PCM bias (GG1110V)
106	3200 cps 28 volt supply (GG1331V)
113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 23 Flashing
d. +00000 ENTR
e. Observe:
VERB 23 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

13. Deleted
14. Deleted
15. Deleted
16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01
FREQUENCY meter to 6.0
FUNCTION to SQUARE
DC BALANCE to midposition
AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and

*Not applicable to LEM Operational SCA, P/N 6007013.

right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	137	IG servo error	135
b	2	138	MG servo error	134
c	3	139	OG servo error	133

*27. Insure that CH 6 DC indicator is lighted.

*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

*32. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall light.

*Not applicable to LEM Operational SCA, P/N 6007013.

*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.

b. Set Test Selector CROSSBAR and GIMBAL SERVO TEST switch as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator AMPLITUDE control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press TEST STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

*35. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. SITE LATITUDE VALUE from Table IV ENTR
k. VERB 33 ENTR
l. 00004 ENTR
m. 00001 ENTR

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 22 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

*39. Within 10 to 90 seconds following step 38.s, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*40. Monitor and record contents of R_1, R_2 and R_3, on DSKY.

*41. In approximately 120 seconds, monitor and record the contents of R_1, R_2 and R_3 again.

*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

*Not applicable to LEM Operational SCA, P/N 6007013.

Table V

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01000 ENTR

*45. On DSKY, enter V16 N20 ENTR and verify that contents of R_1, R_2, and R_3 are approximately 01000.

*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.
b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.
c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	144	204	IG 1X resolver sin ±10°
c	143	205	MG 1X resolver sin ±10°

IG, MG, AND OG 1X RESOLVER SIN AND COS

47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500 ENTR

*Not applicable to LEM Operational SCA, P/N 6007013

f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of R_1, R_2, and R_3.

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.

c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Table VII

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG 1X resolver cos (GG2113V)
b	242	121	MG 1X resolver cos (GG2143V)
c	241	122	OG 1X resolver cos (GG2173V)
d	144	123	IG 1X resolver sin (GG2112V)
e	143	124	MG 1X resolver sin (GG2142V)
f	142	125	OG 1X resolver sin (GG2172V)

50. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. Observe:
GIMBAL LOCK lamp is lighted.
i. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of R_1, R_2, and R_3.

52. Repeat step 49.

53. Perform following DSKY operations
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +22500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +22500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +22500 ENTR
h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of R_1, R_2, and R_3.

55. Repeat step 49.

56. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR

b. VERB 21 NOUN 22 Flashing
c. +31500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +31500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +31500 ENTR
h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of R_1, R_2, and R_3.

58. Repeat step 49.

59. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

a. Set all Decade Error Bridge switches and controls to OFF, minimum or zero.

b. Connect cable W172 to GSE distribution box (GDB).

c. Connect RCT power cable to facility 115 vac power.

d. Connect jumper from Decade Error Bridge (DEB) front panel OUTPUT jacks to DEB front panel SIGNAL INPUT jacks.

e. Turn 800~ REFERENCE INPUT VOLTAGE switch on DEB from OFF to 26V. POWER indicator shall light.

f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.

g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (READ RATE TABLE INPUT and LORS RATE TABLE CONTROL) are deenergized.

h. READ MODE/SET MODE shall be placed in SET MODE position.

i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.

j. Determine that REFERENCE QUADRANT VERNIER dial is set to 0°, and REFERENCE QUADRANT switch is set to 0° - 90°.

k. Determine that DEB DEGREES dials are set to 0°.

l. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating RESOLVER ANGLE TRANSMITTER control CW, the 1X or coarse resolver is at one of its two nulls.

m. Press MON FINE pushbutton. MON

FINE indicator lights. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating the RESOLVER ANGLE TRANSMITTER control CW, the 16X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the RESOLVER ANGLE TRANSMITTER control is rotated CW (increasing angle).

n. Select MON COARSE.

o. With the SENSITIVITY control fully CCW, set the REFERENCE QUADRANT switch to 90° - 180° and set DEB DEGREES dials to 90°.

p. Null meter using REFERENCE QUADRANT VERNIER control. Leave the REFERENCE QUADRANT VERNIER control in this position for all following tests.

q. Set REFERENCE QUADRANT switch to 0° - 90°.

*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

*65. Perform following DSKY operations:
a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*Not applicable to LEM Operational SCA, P/N 6007013.

*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).

*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on the Monitor panel and PROG alarm lamp on the DSKY will light during performance of steps 75 through 85. Ignore the lamp indications.

75. Perform following DSKY operations:
VERB 36 ENTR
VERB 40 NOUN 40 ENTR

76. Set the following switches on the DEB and RCT control panel:

a. DEB - REFERENCE QUADRANT to 0° - 90°.

b. DEB - SENSITIVITY to fully CCW.

c. RCT - perform step 60g.

d. RCT - SET MODE to lighted.

e. DEB - DEGREES to 45.000.

f. RCT - MON COARSE to lighted.

g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.

h. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive coarse scale.

i. DEB - SENSITIVITY to fully CCW.

j. RCT - MON FINE to lighted.

k. DEB - DEGREES to 0 + 00000.

l. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive fine scale.

m. DEB - SENSITIVITY to fully CCW.

n. RCT - remove switch setting from step c.

77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 04500 and R_3 is approximately 00000.

78A. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin (GG3324V)
131	Trunnion 1X resolver cos (GG3325V)

80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

*Not applicable to LEM Operational SCA, P/N 6007013.

81. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R_1 is approximately 00000 and R_2 is approximately 04500.

82. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800~ REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during step 86. Ignore lamp indication.

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR

87. Perform following DSKY operations:

a. VERB 43 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01600 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01600 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01600 ENTR

88. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.

90. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing

d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

b. MG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

c. OG CDU fine error = $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1\ (\pm 20\%)$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. IG 1X resolver sin ±10° = $\frac{2\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. MG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. OG 1X resolver cos = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

d. IG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

e. MG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

f. OG 1X resolver sin = $\frac{8.5\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

4. Perform following attitude error calculations:

a. Yaw attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

b. Pitch attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

c. Roll attitude error = $\frac{2.44\ (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1\ (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

b. MG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

c. OG servo error = $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91\ (\pm 15\%)$

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 18

JDC NO. 12620
REV H
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST

TITLE _____

SER. NO. _____ DWG _____ REV. ____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION

TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE

NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME / AFFILIATION APPROVED BY _____ NAME / AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A.10	Bus Voltage	VDC	27.00		29.00		
B.2	28 VDC LGC Operate	VDC	3.9		4.8		
	28 VDC IMU Standby	VDC	3.9		4.8		
B.9	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B.10	Bus Voltage	VDC	27.75		28.25		
B.11	*Cal Module Temp.	VDC	0.40		1.26		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*IRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 18

JDC NO. 12620
REV H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53		
	3200 cps, 28V Supply	VDC	4.20		4.80		
	800 cps, 28V Supply	VDC	4.20		4.80		
B.21	IG Servo Error SCA input (Test a)	VAC					
	IG Servo Error SCA output (Test a)	VDC					
	MG Servo Error SCA input (Test b)	VAC					
	MG Servo Error SCA output (Test b)	VDC					
	OG Servo Error SCA input (Test c)	VAC					
	OG Servo Error SCA output (Test c)	VDC					
B.35.a	*IG TMC Channel 6	V/PP					
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B.35.b	*MG TMC Channel 6	V/PP					
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 18

JDC NO. 12620
REV H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.35.c	*OG TMC Channel 6	V P/P					
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B.40	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41	*DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.41.a	*R & D 2.5 VDC Bias	VDC					
B.42.a	*IG CDU Fine Error (PAVM)	VAC					
	*IG CDU Fine Error (DVM)	VDC					
B.42.b	*MG CDU Fine Error (PAVM)	VAC					
	*MG CDU Fine Error (DVM)	VDC					
B.42.c	*OG CDU Fine Error (PAVM)	VAC					
	*OG CDU Fine Error (DVM)	VDC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 18

JDC NO. 12620
REV H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.46.a	*OG 1X Resolver Sin ±10° (Test A) (TES 203)	VDC					
	*OG 1X Resolver Sin ±10° (Test A) (XBR 142)	VAC					
B.46.b	*IG 1X Resolver Sin ±10° (Test B) (TES 204)	VDC					
	*IG 1X Resolver Sin ±10° (Test B) (XBR 144)	VAC					
B.46.c	*MG 1X Resolver Sin ±10° (Test C) (TES 205)	VDC					
	*MG 1X Resolver Sin ±10° (Test C) (XBR 143)	VAC					
B.48	DSKY Row 1	Deg.					
	DSKY Row 2	Deg.					
	DSKY Row 3	Deg.					
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 18

JDC NO. 12620 REV H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC					
B.49.c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC					
B.49.d	IG 1X Resolver (45°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC					
B.49.e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC					
B.49.f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC					

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 18

JDC NO. 12620 REV H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.49.f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC					
B.51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.52.a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC					
B.52.b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC					
B.52.c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC					

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JDC NO. 12620 REV H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.52.d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC					
B.52.e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC					
B.52.f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC					
B.54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.					
B.55.a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC					
B.55.b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC					
B.55.c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC					
B.55.d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC					
B.55.e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC					

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JDC NO. 12620
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC					
B.55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC					
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3						
B.58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC					
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC					
B.58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC					
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC					

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC					
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC					
B.58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC					
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC					
B.58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC					
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC					
B.58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC					
	OG 1X Resolver (315°) Sin (Test F) (XBAR 142)	VAC					
B.67	*Shaft CDU Fine Error	VDC	2.45		2.55		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25		
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25		
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55		
B.79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95		
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95		
B.82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95		
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95		
B.89.a	Yaw Attitude Error (PAVM)	VAC					
	Yaw Attitude Error (DVM) (TES 114)	VDC					
B.89.b	Pitch Attitude Error (PAVM)	VAC					

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC					
B.89.c	Roll Attitude Error (PAVM)	VAC					
	Roll Attitude Error (DVM) (TES 116)	VDC					

CALCULATIONS

C.1

$$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.a)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.a)}} = 1\ (\pm 20\%)$$

$$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.b)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.b)}} = 1\ (\pm 20\%)$$

$$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC) (B.42.c)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B.42.c)}} = 1\ (\pm 20\%)$$

C.2

$$\text{*OG1X resolver sin} \pm 10° = \frac{2\ (\text{SCA output (VDC) (B.46.a)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC) (B.46.a)}} = 1\ (\pm 10\%)$$

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin ±10° = 2 (SCA output (VDC) (B.46.c) -2.5V PCM bias) / SCA input (VAC) (B.46.c) = 1 (±10%)		
*IG 1X resolver sin ±10° = 2 (SCA output (VDC) (B.46.b) -2.5V PCM bias) / SCA input (VAC) (B.46.b) = 1 (±10%)		
C.3		
IG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.a) -2.5V PCM bias) / SCA input (VAC) (B.49.a) = 1 (±10%)		
MG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.b) -2.5V PCM bias) / SCA input (VAC) (B.49.b) = 1 (±10%)		
OG 1X resolver cos (45°) = 8.5 (SCA output (VDC)(B.49.c) -2.5V PCM bias) / SCA input (VAC) (B.49.c) = 1 (±10%)		

*Parameters not available in LEM Operational SCA, P/N 6007013

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.d) -2.5V PCM bias) / SCA input (VAC) (B.49.d) = 1 (±10%)		
MG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.e) -2.5V PCM bias) / SCA input (VAC) (B.49.e) = 1 (±10%)		
OG 1X resolver sin (45°) = 8.5 (SCA output (VDC)(B.49.f) -2.5V PCM bias) / SCA input (VAC) (B.49.f.) = 1 (±10%)		
IG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.a) -2.5V PCM bias) / SCA input (VAC) (B.52.a) = -1 (±10%)		
MG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.b) -2.5V PCM bias) / SCA input (VAC) (B.52.b) = -1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos (135°) = 8.5 (SCA output (VDC)(B.52.c) -2.5V PCM bias) / SCA input (VAC) (B.52.c) = -1 (±10%)		
IG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.d) -2.5V PCM bias) / SCA input (VAC) (B.52.d) = 1 (±10%)		
MG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.e) -2.5V PCM bias) / SCA input (VAC) (B.52.e) = 1 (±10%)		
OG 1X resolver sin (135°) = 8.5 (SCA output (VDC)(B.52.f) -2.5V PCM bias) / SCA input (VAC) (B.52.f) = 1 (±10%)		
IG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.a) -2.5V PCM bias) / SCA input (VAC) (B.55.a) = -1 (±10%)		
MG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.b) -2.5V PCM bias) / SCA input (VAC) (B.55.b) = -1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (225°) = 8.5 (SCA output (VDC)(B.55.c) -2.5V PCM bias) / SCA input (VAC) (B.55.c) = -1 (±10%)		
IG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.d) -2.5V PCM bias) / SCA input (VAC) (B.55.d) = -1 (±10%)		
MG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.e) -2.5V PCM bias) / SCA input (VAC) (B.55.e) = -1 (±10%)		
OG 1X resolver sin (225°) = 8.5 (SCA output (VDC)(B.55.f) -2.5V PCM bias) / SCA input (VAC) (B.55.f) = -1 (±10%)		
IG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.a) -2.5V PCM bias) / SCA input (VAC) (B.58.a) = 1 (±10%)		
MG 1X resolver cos (315°) = 8.5 (SCA output (VDC)(B.58.b) -2.5V PCM bias) / SCA input (VAC) (B.58.b) = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont) OG 1X resolver cos (315°) = 8.5 (SCA output (VDC) (B.58.c) -2.5V PCM bias) / SCA input (VAC) (B.58.c) = 1 (±10%)		
IG 1X resolver sin (315°) = 8.5 (SCA output (VDC)(B.58.d) -2.5V PCM bias) / SCA input (VAC) (B.58.d) = -1 (±10%)		
MG 1X resolver sin (315°) = 8.5 (SCA output (VDC)(B.58.e) -2.5V PCM bias) / SCA input (VAC) (B.58.e) = -1 (±10%)		
OG 1X resolver sin (315°) = 8.5 (SCA output (VDC) (B.58.f) -2.5V PCM bias) / SCA input (VAC) (B.58.f) = -1 (±10%)		
C.4 Yaw attitude error = 2.44 (SCA output (VDC)(B.89.a) -2.5V PCM bias) / SCA input (VAC) (B.89.a) = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.4 (cont) Pitch attitude error = 2.44 (SCA output (VDC)(B.89.b) -2.5V PCM bias) / SCA input (VAC) (B.89.b) = 1 (±10%)		
Roll attitude error = 2.44 (SCA output (VDC) (B.89.c) -2.5V PCM bias) / SCA input (VAC) (B.89.c) = 1 (±10%)		
C.5 IG servo error = SCA output (VDC) (B.21 test a) / SCA input (VAC) (B.21 test a) = 0.91 (±15%)		
MG servo error = SCA output (VDC) (B.21 test b) / SCA input (VAC) (B.21 test b) = 0.91 (±15%)		
OG servo error = SCA output (VDC) (B.21 test c) / SCA input (VAC) (B.21 test c) = 0.91 (±15%)		

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SUBSYSTEM LEM G & N SYSTEM | ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-
F	3-28-68	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA	-
G	7-25-68	36586	1, 9, 10, 12	-	EA	-
H	9-26-68	36861	1	-	EA	-
J	12-2-68	37073	All	All	EA	-

REFERENCES
PS 6015000
JDC 12614
JDC 18100

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010. 3. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

NOTE: If VERB display on DSKY contains a number from 11 to 17, KEY REL indicator may flash when DSKY entries are made.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to performance of this JDC, proceed with step A.7; if installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove DSKY Mounting Pedestal

VERIFICATION WITH SIDL REQUIRED BEFORE USE

and DSKY from Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Perform JDC 12614 to place G and N system in ISS STANDBY mode with LGC operating.

NOTE: The 28 VDC G&N Power adjusted in step 8 will vary as result of heater cycling.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 120 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and Standby Requirements of JDC 12614 have been satisfied.

10. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE indicator shall light.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to 101 to measure and record 28 vdc LGC operate voltage (GG1523X) on DVM.

3. Set Test Selector panel to 102 to measure and record 28 vdc IMU standby voltage (GG1513X) on DVM.

PIPA S/G OUTPUT

4. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

5. Insure that CH4AC, CH5AC, and CH6AC pushbuttons are lighted.

6. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity on channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

7. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
Observe:
VERB 22 NOUN 22 Flashing
d. -04500 ENTR
Observe:
VERB 23 NOUN 22 Flashing
e. +03500 ENTR

8. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 9 through 12 successively for each Test Selector panel position listed in Table I.

9. Set Test Selector panel to position listed in Table I.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 11.

11. Perform the following DSKY operation:
VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase out.
118	Y PIPA G/S in-phase out.
119	X PIPA G/S in-phase out.

12. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

13. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
Observe:
VERB 21 NOUN 22 Flashing
b. +00000 ENTR
Observe:
VERB 22 NOUN 22 Flashing
c. -22500 ENTR
Observe:
VERB 23 NOUN 22 Flashing
d. -03500 ENTR

14. Repeat steps 9 through 12 then set all Oscillograph Amplifier sensitivities to OFF.

15. through 19. (Deleted)

20. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

21. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

22. Set Test Selector panel to positions listed below and measure and record DVM indication for each position:

NOTE: SCA TEST TMC INHIBIT indicator on Temperature Monitor Control panel will illuminate when Test Selector panel is set to positions 201 and 202. Following measurements in these positions, press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that above inhibit indicator extinguishes.

Test	Test Selector Panel Position	Signal
a.	*135	Cal Mod Temperature (GG6020T)
b.	*145	R&D vdc bias (GG1111V)
c.	*150	IMU Heater Current (GG2302X)
d.	201	PIPA Temperature (GG2300T)
e.	*202	IRIG Temperature (GG2301T)
f.	103	120 vdc ref. (GG1040V)
g.	104	2.5 vdc PCM bias (GG1110V)
h.	106	3200 cps 28 volt supply (GG1331V)
i.	113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

23. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR

c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. VERB 21 NOUN 01 ENTR
j. 00403 ENTR
k. 00000 ENTR
l. NOUN 15 ENTR
m. 00000 ENTR ENTR
n. 00000 ENTR ENTR
o. 00000 ENTR ENTR
p. 00000 ENTR ENTR
q. 00000 ENTR

24. Set switches on Signal Generator as follows:
a. RANGE to X.01
b. FREQUENCY meter to 6.0
c. FUNCTION to SQUARE
d. DC BALANCE to midposition
e. AMPLITUDE to 70.

25. Perform following DSKY operations:
a. VERB 42 ENTR
b. VERB 33 ENTR

26. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 3200.

27. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

28. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error signal on PAVM. (Input to SCA.)

29. Press TEST START pushbutton on Test Selector panel. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread.

30. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 137 to monitor IG servo error signal on DVM. (Output of SCA.)

31. Measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread.

32. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

33. Calculate IG servo error SCA output to IG servo error SCA input as follows. Record result:

IG servo error =

$$\frac{\text{Step 31, max meter spread}}{\text{Step 29, max meter spread}} = 0.91\ (\pm 15\%)$$

34. Set GIMBAL SERVO TEST switch on Test Selector panel to 2 and set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error signal on PAVM. (Input to SCA.)

35. Repeat step 29.

36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 138 to monitor MG servo error signal on DVM. (Output of SCA.)

37. Repeat steps 31 and 32.

38. Calculate MG servo error SCA output to MG servo error SCA input as follows. Record result.

MG servo error =

$$\frac{\text{Step 37, max meter spread}}{\text{Step 35, max meter spread}} = 0.91\ (\pm 15\%)$$

39. Set GIMBAL SERVO TEST switch on Test Selector panel to 3 and set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error signal on PAVM. (Input to SCA.)

40. Repeat step 29.

41. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 139 to monitor OG servo error signal on DVM. (Output of SCA.)

42. Repeat steps 31 and 32.

43. Calculate OG servo error SCA output to OG servo error SCA input as follows: Record result.

OG servo error =

$$\frac{\text{Step 42, max meter spread}}{\text{Step 40, max meter spread}} = 0.91\ (\pm 15\%)$$

44. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, GG2140C, AND GG2170C)

*45. Insure that AMPLITUDE control on Signal Generator is set to 0.

*46. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.

*47. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

*48. Insure that CH6DC indicator is lighted.

*49. Zero Oscillograph channel 6 and set sensitivity to 0.2 V/CM. Set sensitivity of channel 8 to 2 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*50. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*51. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*52. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

*53. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

*54. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (Input to SCA.)

*55. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (Output of SCA.)

*56. Press to light TEST START pushbutton.

*57. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*58. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*59. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*60. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*61. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (Input to SCA.)

*62. Press to light TEST START pushbutton.

*63. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*64. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*65. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*66. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*67. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (Input to SCA.)

*68. Press to light TEST START pushbutton.

*69. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*70. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*71. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, GG2250, AND GG2280)

*72. Perform following DSKY operations:
a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*73. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*74. Perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. Site Latitude (from Table II) ENTR
k. VERB 33 ENTR
l. 00004 ENTR
m. 00001 ENTR
n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 22 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table II

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.524
NAA	+33.921

*75. Within 10 to 90 seconds after performance of step 74. s, perform following DSKY operations:
a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*76. Record DSKY Row 1, Row 2, and Row 3 indications.

*77. Approximately 120 seconds after performance of step 76, record DSKY Row 1, Row 2, and Row 3 indications.

*78. Set Test Selector panel to 145 and CROSSBAR CONTROL on Primary Signal Selector panel to 271. Record R&D 2.5 vdc bias voltage indicated on DVM.

*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)

*80. Set Test Selector panel to 140 to monitor IG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 81 will vary.

*81. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*82. Calculate SCA output IG CDU fine error to SCA input IG CDU fine error as follows. Record result:

IG CDU fine error =

$$\frac{\text{Step 81 (vdc)} - \text{Step 78}}{\text{2.00 x Step 81 (vac)}} = 1\ (\pm 20\%)$$

*83. Connect PSA TPA buffered probes to TB3-38 (high) and TB3-34 (low) to monitor MG CDU fine error signal on PAVM. (Input to SCA.)

*84. Set Test Selector panel to 141 to monitor MG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 85 will vary.

*85. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*86. Calculate SCA output MG CDU fine error to SCA input MG CDU fine error as follows. Record result:

MG CDU fine error =

$$\frac{\text{Step 85 (vdc)} - \text{Step 78}}{\text{2.00 x Step 85 (vac)}} = 1\ (\pm 20\%)$$

*87. Connect PSA TPA buffered probes to TB3-41 (high) and TB3-34 (low) to monitor OG CDU fine error signal on PAVM. (Input to SCA.)

*88. Set Test Selector panel to 142 to monitor OG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 89 will vary.

*89. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*90. Calculate SCA output OG CDU fine error to SCA input OG CDU fine error as follows. Record result:

OG CDU fine error =

$$\frac{\text{Step 89 (vdc)} - \text{Step 78}}{\text{2.00 x Step 89 (vac)}} = 1\ (\pm 20\%)$$

*91. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 02512		ENTR
c. 77776		ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, GG2151, AND GG 2181)

*92. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +01000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +01000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +01000		ENTR

*93. Enter VERB 16 NOUN 20 into DSKY and press ENTR pushbutton. Verify that Row 1, Row 2, and Row 3 indicate approximately +01000.

*94. Set Test Selector panel to 203 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

*95. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*96. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record results:

OG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 94 - Step 22.g)}}{\text{Step 95}} = 1\ (\pm 10\%)$$

*97. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*98. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 204. Measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

*99. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record results:

IG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 98 - Step 22.g)}}{\text{Step 97}} = 1\ (\pm 10\%)$$

*100. Set Test Selector panel to 205 and measure and record MG 1X resolver sin voltage indicated on DVM. (Ouput of SCA.)

*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*102. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record results:

MG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 100 - Step 22.g)}}{\text{Step 101}} = 1\ (\pm 10\%)$$

IG, MG, AND OG 1X RESOLVER SIN AND COS

103. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing

c. +04500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +04500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +04500		ENTR
h. VERB 16	NOUN 20	ENTR

104. Record DSKY Row 1, Row 2, and Row 3 indications.

105. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

106. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

107. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 106 - Step 22.g)}}{\text{Step 105}} = 1\ (\pm 10\%)$$

108. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

109. Set CROSSBAR CONTROL on Primary Signal Selector panel to 242 and measure and record MG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

110. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record results:

MG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 108 - Step 22.g)}}{\text{Step 109}} = 1\ (\pm 10\%)$$

111. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

112. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

113. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 112 - Step 22.g)}}{\text{Step 111}} = 1\ (\pm 10\%)$$

114. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

115. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

116. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 114 - Step 22.g}}{\text{Step 115}} = 1\ (\pm 10\%)$$

117. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

118. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

119. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 118 - Step 22.g)}}{\text{Step 117}} = 1\ (\pm 10\%)$$

120. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

121. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

122. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 120 - Step 22.g)}}{\text{Step 121}} = 1\ (\pm 10\%)$$

123. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +13500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +13500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +13500		ENTR
h. Observe:		
GIMBAL LOCK		Lighted
i. VERB 16	NOUN 20	ENTR

124. Record DSKY Row 1, Row 2, and Row 3 indications.

125. Repeat steps 105 and 106.

126. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (135°) =

$$\frac{\text{8.5 [Step 125 (106) - Step 22.g]}}{\text{Step 125 (105)}} = -1\ (\pm 10\%)$$

127. Repeat steps 108 and 109.

128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos (135°) =

$$\frac{\text{8.5 [Step 127 (108) - Step 22.g]}}{\text{Step 127 (109)}} = -1\ (\pm 10\%)$$

129. Repeat steps 111 and 112.

130. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (135°) =

$$\frac{\text{8.5 [Step 129 (112) - Step 22.g]}}{\text{Step 129 (111)}} = -1\ (\pm 10\%)$$

131. Repeat steps 114 and 115.

132. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:
IG 1X resolver sin (135°) =
8.5 [Step 131 (114) - Step 22.g] / Step 131 (115) = 1 (±10%)

133. Repeat steps 117 and 118.

134. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:
MG 1X resolver sin (135°) =
8.5 [Step 133 (118) - Step 22.g] / Step 133 (117) = 1 (±10%)

135. Repeat steps 120 and 121.

136. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:
OG 1X resolver sin (135°) =
8.5 [Step 135 (120) - Step 22.g] / Step 135 (121) = 1 (±10%)

137. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+22500		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+22500		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+22500		ENTR
h.	VERB 16	NOUN 20	ENTR

138. Record DSKY Row 1, Row 2, and Row 3 indications.

139. Repeat steps 105 and 106.

140. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:
IG 1X resolver cos (225°) =
8.5 [Step 139 (106) - Step 22.g] / Step 139 (105) = -1 (±10%)

141. Repeat steps 108 and 109.

142. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:
MG 1X resolver cos (225°) =
8.5 [Step 141 (108) - Step 22.g] / Step 141 (109) = -1 (±10%)

143. Repeat steps 111 and 112.

144. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:
OG 1X resolver cos (225°)
8.5 [Step 143 (112) - Step 22.g] / Step 143 (111) = -1 (±10%)

145. Repeat steps 114 and 115.

146. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:
IG 1X resolver sin (225°) =
8.5 [Step 145 (114) - Step 22.g] / Step 145 (115) = -1 (±10%)

147. Repeat steps 117 and 118.

148. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:
MG 1X resolver sin (225°) =
8.5 [Step 147 (118) - Step 22.g] / Step 147 (117) = -1 (±10%)

149. Repeat steps 120 and 121.

150. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows: Record result:
OG 1X resolver sin (225°) =
8.5 [Step 149 (120) - Step 22.g] / Step 149 (121) = -1 (±10%)

151. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+31500		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+31500		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+31500		ENTR
h.	VERB 16	NOUN 20	ENTR

152. Record DSKY Row 1, Row 2, and Row 3 indications.

153. Repeat steps 105 and 106.

154. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:
IG 1X resolver cos (315°) =
8.5 [Step 153 (106) - Step 22.g] / Step 153 (105) = 1 (±10%)

155. Repeat steps 108 and 109.

156. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:
MG 1X resolver cos (315°) =
8.5 [Step 155 (108) - Step 22.g] / Step 155 (109) = 1 (±10%)

157. Repeat steps 111 and 112.

158. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:
OG 1X resolver cos (315°) =
8.5 [Step 157 (112) - Step 22.g] / Step 157 (111) = 1 (±10%)

159. Repeat steps 114 and 115.

160. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:
IG 1X resolver sin (315°) =
8.5 [Step 159 (114) - Step 22.g] / Step 159 (115) = -1 (±10%)

161. Repeat steps 117 and 118.

162. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:
MG 1X resolver sin (315°) =
8.5 [Step 161 (118) - Step 22.g] / Step 161 (117) = -1 (±10%)

163. Repeat steps 120 and 121.

164. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:
OG 1X resolver sin (315°) =
8.5 [Step 163 (120) - Step 22.g] / Step 163 (121) = -1 (±10%)

165. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

RR SHAFT AND TRUNNION FINE ERROR

166. Prepare Resolver Circuit Tester (RCT) as follows:

a. Set Decade Error Bridge (DEB) panel switches and controls to OFF, minimum, or zero.
b. Connect cable W172 to GSE distribution box (GDB).
c. Connect RCT power cable to facility 115 vac power.
d. Connect jumper from DEB panel OUTPUT jacks to SIGNAL INPUT jacks.
e. Set 800~ REFERENCE INPUT VOLTAGE switch to 26V. POWER indicator shall light.
f. Press POWER ON pushbutton on RCT Control panel. POWER ON, READ MODE, and MON COARSE or MON FINE indicators shall light.
g. Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.
h. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.
i. Insure that MON COARSE indicator is lighted.
j. Set REFERENCE QUADRANT VERNIER control to 0° and REFERENCE QUADRANT switch to 0°-90°.
k. Set DEGREES dials to 0+00.000.
l. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).
m. Press MON COARSE/MON FINE pushbutton. MON FINE indicator shall light.
n. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).
o. Press MON COARSE/MON FINE pushbutton. MON COARSE indicator shall light. Null meter shall deflect right (+). If null meter does not deflect right, repeat steps B.166.l through B.166.o.
p. Set REFERENCE QUADRANT switch to 90°-180° and set DEGREES dials to 90+00.000 to reduce sensitivity.
q. Null meter using REFERENCE QUADRANT VERNIER control. Leave REFERENCE QUADRANT VERNIER control in this position for all following tests.

r. Set REFERENCE QUADRANT switch to 0°-90°.

*167. Set RESOLVER ANGLE TRANSMITTER control to 0.

*168. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*169. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light.

*170. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 171 through 179. Ignore lamp indications.

*171. Perform following DSKY operations:

a.	VERB 40	NOUN 40	ENTR
b.	VERB 21	NOUN 10	ENTR
c.	00012		ENTR
d.	00011		ENTR

*172. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (high) and TB3-34 (low) and connecting jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

*173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication.

*174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication.

*175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light.

*176. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high).

*178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication.

*179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication.

*180. Perform following DSKY operations:

a.	VERB 21	NOUN 10	ENTR
b.	00012		ENTR
c.	00010		ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 181 through 194.

181. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 40 ENTR

182. Set following switches on DEB and RCT Control panels:

a. DEB - REFERENCE QUADRANT to 0°-90°.
b. DEB - SENSITIVITY fully CCW.
c. RCT - Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.
d. RCT - SET MODE lighted.
e. DEB - DEGREES to 0+45.000.
f. RCT - MON COARSE lighted.
g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.
h. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE control to null meter.
i. DEB - SENSITIVITY fully CCW.
j. RCT - MON FINE lighted.
k. DEB - DEGREES to 0+00.000.
l. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE and FINE controls to null meter.
m. DEB - SENSITIVITY fully CCW.
n. RCT - Insure that IG, MG, and OG SELECT are not lighted.

183. Press TRUN SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

184. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 04500 and Row 2 indicates approximately 00000.

185. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

186. Set Test Selector panel to 128. Measure and record trunnion 1X resolver sin voltage output from SCA on DVM.

187. Set Test Selector panel to 131. Measure and record trunnion 1X resolver cos voltage output from SCA on DVM.

188. Press SHAFT SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

189. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 00000 and Row 2 indicates approximately 04500.

190. Set Test Selector panel to 129. Measure and record shaft 1X resolver sin voltage output from SCA on DVM.

191. Set Test Selector panel to 130. Measure and record shaft 1X resolver cos voltage output from SCA on DVM.

192. Set RESOLVER ANGLE TRANSMITTER control to 0.

193. Set 800~ REFERENCE INPUT VOLTAGE switch on DEB to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

194. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during performance of step 195. Ignore lamp indication.

195. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR
d. VERB 43 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +01600 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +01600 ENTR
i. Observe:
VERB 23 NOUN 22 Flashing
j. +01600 ENTR

196. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

197. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record yaw attitude error total voltage indicated on PAVM. (Input to SCA.)

198. Set Test Selector panel to 114 and measure and record yaw attitude error voltage indicated on DVM. (Output of SCA.)

199. Calculate SCA output yaw attitude error to SCA input yaw attitude error as follows. Record result:

Yaw attitude error =

$$\frac{2.44\ (\text{Step 198} - \text{Step 22.g})}{\text{Step 197}} = 1\ (\pm 10\%)$$

200. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record pitch attitude error total voltage indicated on PAVM. (Input to SCA.)

201. Set Test Selector panel to 115 and measure and record pitch attitude error voltage indicated on DVM. (Output of SCA.)

202. Calculate SCA output pitch attitude error to SCA input pitch attitude error as follows. Record result:

Pitch attitude error =

$$\frac{2.44\ (\text{Step 201} - \text{Step 22.g})}{\text{Step 200}} = 1\ (\pm 10\%)$$

203. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record roll attitude error total voltage indicated on PAVM. (Input to SCA.)

204. Set Test Selector panel to 116 and measure and record roll attitude error voltage indicated on DVM. (Output of SCA.)

205. Calculate SCA output roll attitude error to SCA input roll attitude error as follows. Record result:

Roll attitude error =

$$\frac{2.44\ (\text{Step 204} - \text{Step 22.g})}{\text{Step 203}} = 1\ (\pm 10\%)$$

206. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

207. Press POWER ON pushbutton on RCT Control panel. The pushbutton shall extinguish.

208. Disconnect cable W172 from GDB.

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EQUIPMENT TEST
DATA SHEET 1 OF 19

NO. 12620 JDC
REV J
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE
NAME _____ SER. NO. ____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A. 8	Bus voltage	vdc	27.00		29.00		
B. 2	28 vdc LGC operate	vdc	3.9		4.8		
B. 3	28 vdc IMU standby	vdc	3.9		4.8		
B. 13	Loop closure (Channel 8 to 4)						
	Traces centered						
B. 15	Loop closure (Channel 8 to 5)						
	Traces centered						
B. 19	Loop closure (Channel 8 to 6)						
	Traces centered						
B. 20	Bus voltage	vdc	27.75		28.25		
B. 22. a	*Cal Mod Temp	vdc	0.40		1.26		
B. 22. b	*R&D 2.5 vdc bias	vdc	2.47		2.53		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 19

JDC NO. 12620
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 22. c	*IMU heater current	vdc	3.9		4.8		
B. 22. d	PIPA Temp	vdc	2.0		3.0		
B. 22. c	*IRIG Temp	vdc	2.37		3.70		
B. 22. f	120 vdc reference	vdc	2.80		4.20		
B. 22. g	2.5 vdc PCM bias	vdc	2.47		2.53		
B. 22. h	3200 cps, 28v supply	vdc	4.20		4.80		
B. 22. i	800 cps, 28v supply	vdc	4.20		4.80		
B. 29	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (IG servo error, SCA input)	vac					
B. 31	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (IG servo error, SCA output)	vdc					
B. 33	IG servo error		0.7735		1.0465		
B. 35 (B. 29)	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (MG servo error, SCA input)	vac					

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EQUIPMENT TEST
DATA SHEET 3 OF 19

JDC NO. 12620
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 37 (B. 31)	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (MG servo error, SCA output)	vdc					
B. 38	MG servo error		0.7735		1.0465		
B. 40 (B. 29)	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (OG servo error, SCA input)	vac					
B. 42 (B. 31)	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (OG servo error, SCA output)	vdc					
B. 43	OG servo error		0.7735		1.0465		
B. 59	*IG TMC (Channel 6)	v p-p					
	*IG TMC (Channel 8)	v p-p	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		
B. 65	*MG TMC (Channel 6)	v p-p					
	*MG TMC (Channel 8)	v p-p	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%		

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EQUIPMENT TEST
DATA SHEET 4 OF 19

JDC NO. 12620
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 71	*OG TMC (Channel 6)	v p-p					
	*OG TMC (Channel 8)	v p-p	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%		
B. 76	*Row 1	deg					
	*Row 2	deg					
	*Row 3	deg					
B. 77	*Row 1	deg					
	*Row 2	deg					
	*Row 3	deg					
B. 78	*R&D 2.5 vdc bias	vdc					
B. 81	*IG CDU fine error (PAVM)	vac					
	*IG CDU fine error (DVM)	vdc					
B. 82	*IG CDU fine error		0.80		1.20		
B. 85	*MG CDU fine error (PAVM)	vac					
	*MG CDU fine error (DVM)	vdc					
B. 86	*MG CDU fine error		0.80		1.20		
B. 89	*OG CDU fine error (PAVM)	vac					
	*OG CDU fine error (DVM)	vdc					

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EQUIPMENT TEST
DATA SHEET 5 OF 19

JDC NO. 12620
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 90	*OG CDU fine error		0.80		1.20		
B. 94	*OG 1X resolver	vdc					
B. 95	*OG 1X resolver	vac					
B. 96	*OG 1X resolver		0.90		1.10		
B. 97	*IG 1X resolver	vac					
B. 98	*IG 1X resolver	vdc					
B. 99	*IG 1X resolver		0.90		1.10		
B. 100	*MG 1X resolver	vdc					
B. 101	*MG 1X resolver	vac					
B. 102	*MG 1X resolver		0.90		1.10		
B. 104	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 105	IG 1X resolver cos	vac					
B. 106	IG 1X resolver cos	vdc					
B. 107	IG 1X resolver cos (45°)		0.90		1.10		
B. 108	MG 1X resolver cos	vdc					
B. 109	MG 1X resolver cos	vac					
B. 110	MG 1X resolver cos (45°)		0.90		1.10		
B. 111	OG 1X resolver cos	vac					

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EQUIPMENT TEST
DATA SHEET 6 OF 19

JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 112	OG 1X resolver cos	vdc					
B. 113	OG 1X resolver cos (45°)		0.90		1.10		
B. 114	IG 1X resolver sin	vdc					
B. 115	IG 1X resolver sin	vac					
B. 116	IG 1X resolver sin (45°)		0.90		1.10		
B. 117	MG 1X resolver sin	vac					
B. 118	MG 1X resolver sin	vdc					
B. 119	MG 1X resolver sin (45°)		0.90		1.10		
B. 120	OG 1X resolver sin	vdc					
B. 121	OG 1X resolver sin	vac					
B. 122	OG 1X resolver sin (45°)		0.90		1.10		
B. 124	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 125 (B. 105)	IG 1X resolver cos	vac					
B. 125 (B. 106)	IG 1X resolver cos	vdc					
B. 126	IG 1X resolver cos (135°)		-0.90		-1.10		
B. 127 (B. 108)	MG 1X resolver cos	vdc					

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EQUIPMENT TEST
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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 127 (B. 109)	MG 1X resolver cos	vac					
B. 128	MG 1X resolver cos (135°)		-0.90		-1.10		
B. 129 (B. 111)	OG 1X resolver cos	vac					
B. 129 (B. 112)	OG 1X resolver cos	vdc					
B. 130	OG 1X resolver cos (135°)		-0.90		-1.10		
B. 131 (B. 114)	IG 1X resolver sin	vdc					
B. 131 (B. 115)	IG 1X resolver sin	vac					
B. 132	IG 1X resolver sin (135°)		0.90		1.10		
B. 133 (B. 117)	MG 1X resolver sin	vac					
B. 133 (B. 118)	MG 1X resolver sin	vdc					
B. 134	MG 1X resolver sin (135°)		0.90		1.10		
B. 135 (B. 120)	OG 1X resolver sin	vdc					
B. 135 (B. 121)	OG 1X resolver sin	vac					
B. 136	OG 1X resolver sin (135°)		0.90		1.10		

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EQUIPMENT TEST
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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 138	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 139 (B. 105)	IG 1X resolver cos	vac					
B. 139 (B. 106)	IG 1X resolver cos	vdc					
B. 140	IG 1X resolver cos (225°)		-0.90		-1.10		
B. 141 (B. 108)	MG 1X resolver cos	vdc					
B. 141 (B. 109)	MG 1X resolver cos	vac					
B. 142	MG 1X resolver cos (225°)		-0.90		-1.10		
B. 143 (B. 111)	OG 1X resolver cos	vac					
B. 143 (B. 112)	OG 1X resolver cos	vdc					
B. 144	OG 1X resolver cos (225°)		-0.90		-1.10		
B. 145 (B. 114)	IG 1X resolver sin	vdc					
B. 145 (B. 115)	IG 1X resolver sin	vac					
B. 146	IG 1X resolver sin (225°)		-0.90		-1.10		

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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 147 (B. 117)	MG 1X resolver sin	vac					
B. 147 (B. 118)	MG 1X resolver sin	vdc					
B. 148	MG 1X resolver sin (225°)		-0.90		-1.10		
B. 149 (B. 120)	OG 1X resolver sin	vdc					
B. 149 (B. 121)	OG 1X resolver sin	vac					
B. 150	OG 1X resolver sin (225°)		-0.90		-1.10		
B. 152	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 153 (B. 105)	IG 1X resolver cos	vac					
B. 153 (B. 106)	IG 1X resolver cos	vdc					
B. 154	IG 1X resolver cos (315°)		0.90		1.10		
B. 155 (B. 108)	MG 1X resolver cos	vdc					
B. 155 (B. 109)	MG 1X resolver cos	vac					
B. 156	MG 1X resolver cos (315°)		0.90		1.10		

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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 157 (B. 111)	OG 1X resolver cos	vac					
B. 157 (B. 112)	OG 1X resolver cos	vdc					
B. 158	OG 1X resolver cos (315°)		0. 90		1. 10		
B. 159 (B. 114)	IG 1X resolver sin	vdc					
B. 159 (B. 115)	IG 1X resolver sin	vac					
B. 160	IG 1X resolver sin (315°)		-0. 90		-1. 10		
B. 161 (B. 117)	MG 1X resolver sin	vac					
B. 161 (B. 118)	MG 1X resolver sin	vdc					
B. 162	MG 1X resolver sin (315°)		-0. 90		-1. 10		
B. 163 (B. 120)	OG 1X resolver sin	vdc					
B. 163 (B. 121)	OG 1X resolver sin	vac					
B. 164	OG 1X resolver sin (315°)		-0. 90		-1. 10		
B. 173	*Shaft CDU fine error	vdc	2. 45		2. 55		

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EQUIPMENT TEST
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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 174	*Shaft CDU fine error	vdc	3. 75		4. 25		
B. 178	*Trunnion CDU fine error	vdc	3. 75		4. 25		
B. 179	*Trunnion CDU fine error	vdc	2. 45		2. 55		
B. 186	Trunnion 1X resolver sin	vdc	4. 45		4. 95		
B. 187	Trunnion 1X resolver cos	vdc	4. 45		4. 95		
B. 190	Shaft 1X resolver sin	vdc	4. 45		4. 95		
B. 191	Shaft 1X resolver cos	vdc	4. 45		4. 95		
B. 197	Yaw attitude error	vac					
B. 198	Yaw attitude error	vdc					
B. 199	Yaw attitude error		0. 90		1. 10		
B. 200	Pitch attitude error	vac					
B. 201	Pitch attitude error	vdc					
B. 202	Pitch attitude error		0. 90		1. 10		
B. 203	Roll attitude error	vac					
B. 204	Roll attitude error	vdc					
B. 205	Roll attitude error		0. 90		1. 10		

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EQUIPMENT TEST
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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 33	IG Servo Error = $\frac{\text{SCA output (Step 31, Maximum Meter Spread)}}{\text{SCA input (Step 29, Maximum Meter Spread)}}$ = 0. 91 (±15%)
B. 38	MG Servo Error = $\frac{\text{SCA output (Step 37, Maximum Meter Spread)}}{\text{SCA input (Step 35, Maximum Meter Spread)}}$ = 0. 91 (±15%)
B. 43	OG Servo Error = $\frac{\text{SCA output (Step 42, Maximum Meter Spread)}}{\text{SCA input (Step 40, Maximum Meter Spread)}}$ = 0. 91 (±15%)
B. 82	*IG CDU Fine Error = $\frac{\text{SCA output (Step 81, vdc) - 2. 5V R\&D Bias (Step 78)}}{\text{2. 00 x SCA input (Step 81, vac)}}$ = 1 (±20%)
B. 86	*MG CDU Fine Error = $\frac{\text{SCA output (Step 85, vdc) - 2. 5V R\&D Bias (Step 78)}}{\text{2. 00 x SCA input (Step 85, vac)}}$ = 1 (±20%)

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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 90	*OG CDU Fine Error = $\frac{\text{SCA output (Step 89, vdc) - 2. 5V R\&D Bias (Step 78)}}{\text{2. 00 x SCA input (Step 89, vac)}}$ = 1 (±20%)
B. 96	*OG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 94) - 2. 5V PCM Bias (Step 22. g)]}}{\text{SCA input (Step 95)}}$ = 1 (±10%)
B. 99	*IG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 98) - 2. 5V PCM Bias (Step 22. g)]}}{\text{SCA input (Step 97)}}$ = 1 (±10%)
B. 102	*MG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 100) - 2. 5V PCM Bias (Step 22. g)]}}{\text{SCA input (Step 101)}}$ = 1 (±10%)
B. 107	IG 1X Resolver Cos (45°) = $\frac{\text{8. 5 x [SCA output (Step 106) - 2. 5V PCM Bias (Step 22. g)]}}{\text{SCA Input (Step 105)}}$ = 1 (±10%)

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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 110	MG 1X Resolver Cos (45°) = $\frac{8.5 \times [\text{SCA output (Step 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 109)}}$ = 1 (±10%)
B. 113	OG 1X Resolver Cos (45°) = $\frac{8.5 \times [\text{SCA Output (Step 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 111)}}$ = 1 (±10%)
B. 116	IG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 115)}}$ = 1 (±10%)
B. 119	MG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 117)}}$ = 1 (±10%)
B. 122	OG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 121)}}$ = 1 (±10%)

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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 126	IG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 125, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 125, 105)}}$ = -1 (±10%)
B. 128	MG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 127, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 127, 109)}}$ = -1 (±10%)
B. 130	OG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 129, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 129, 111)}}$ = -1 (±10%)
B. 132	IG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 131, 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 131, 115)}}$ = 1 (±10%)
B. 134	MG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 133, 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 133, 117)}}$ = 1 (±10%)

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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 136	OG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 135, 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 135, 121)}}$ = 1 (±10%)
B. 140	IG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 139, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 139, 105)}}$ = -1 (±10%)
B. 142	MG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 141, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 141, 109)}}$ = -1 (±10%)
B. 144	OG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 143, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 143, 111)}}$ = -1 (±10%)
B. 146	IG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 145, 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 145, 115)}}$ = -1 (±10%)

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EQUIPMENT TEST
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JDC NO. 12620 REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 148	MG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 147, 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 147, 117)}}$ = -1 (±10%)
B. 150	OG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 149, 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 149, 121)}}$ = -1 (±10%)
B. 154	IG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 153, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 153, 105)}}$ = 1 (±10%)
B. 156	MG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 155, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 155, 109)}}$ = 1 (±10%)
B. 158	OG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 157, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 157, 111)}}$ = 1 (±10%)

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EQUIPMENT TEST
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JDC NO. 12620
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 160	IG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 159, 114)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 159, 115)}} = -1\ (\pm 10\%)$
B. 162	MG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 161, 118)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 161, 117)}} = -1\ (\pm 10\%)$
B. 164	OG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 163, 120)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 163, 121)}} = -1\ (\pm 10\%)$
B. 199	Yaw Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 198)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 197)}} = 1\ (\pm 10\%)$
B. 202	Pitch Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 201)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 200)}} = 1\ (\pm 10\%)$

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JDC NO. 12620
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 205	Roll Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 204)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 203)}} = 1\ (\pm 10\%)$

DATE 26 JAN 67

FORM 00.48
Chg. 7-23-65

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-
F	3-28-68	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA	-
G	7-25-68	36586	1, 9, 10, 12	-	EA	-
H	9-26-68	36861	1	-	EA	-
J	12-2-68	37073	All	All	EA	-
K	2-24-69	37363	1, 2, 5, 6, 19	1, 2, 3	EA	-

REFERENCES
PS 6015000
JDC 12614
JDC 18100

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010. 3. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

NOTE: If VERB display on DSKY contains a number from 11 to 17, KEY REL indicator may flash when DSKY entries are made.

A. PREPARATION

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

NOTE: If SCA has been previously installed in system configuration prior to performance of this JDC, proceed with step A.7; if installation is required, proceed with step A.2.

2. Remove DSKY Mounting Pedestal

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and DSKY from Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Connnect cable W157-P1 to 30J2 on SCM breakout box and W157-P2 to P1 on cable W142. Insure that all other cables are connected to the SCM as shown in JDC 12609.

7A. Perform JDC 12614 to place G and N system in ISS STANDBY mode with LGC operating.

NOTE: The 28 VDC G&N Power adjusted in step 8 will vary as result of heater cycling.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 120 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and Standby Requirements of JDC 12614 have been satisfied.

10. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE indicator shall light.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to 101 to measure and record 28 vdc LGC operate voltage (GG1523X) on DVM.

3. Set Test Selector panel to 102 to measure and record 28 vdc IMU standby voltage (GG1513X) on DVM.

PIPA S/G OUTPUT

4. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

5. Insure that CH4AC, CH5AC, and CH6AC pushbuttons are lighted.

6. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity on channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

7. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
Observe:
VERB 22 NOUN 22 Flashing
d. -04500 ENTR
Observe:
VERB 23 NOUN 22 Flashing
e. +03500 ENTR

8. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 9 through 12 successively for each Test Selector panel position listed in Table I.

9. Set Test Selector panel to position listed in Table I.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 11.

11. Perform the following DSKY operation:
VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase out.
118	Y PIPA G/S in-phase out.
119	X PIPA G/S in-phase out.

12. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

13. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
Observe:
VERB 21 NOUN 22 Flashing
b. +00000 ENTR
Observe:
VERB 22 NOUN 22 Flashing
c. -22500 ENTR
Observe:
VERB 23 NOUN 22 Flashing
d. -03500 ENTR

14. Repeat steps 9 through 12 then set all Oscillograph Amplifier sensitivities to OFF.

15. through 19. (Deleted)

20. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

21. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

22. Set Test Selector panel to positions listed below and measure and record DVM indication for each position:

NOTE: SCA TEST TMC INHIBIT indicator on Temperature Monitor Control panel will illuminate when Test Selector panel is set to positions 201 and 202. Following measurements in these positions, press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that above inhibit indicator extinguishes.

Test	Test Selector Panel Position	Signal
a.	*135	Cal Mod Temperature (GG6020T)
b.	*145	R&D vdc bias (GG1111V)
c.	*150	IMU Heater Current (GG2302X)
d.	201	PIPA Temperature (GG2300T)
e.	*202	IRIG Temperature (GG2301T)
f.	103	120 vdc ref. (GG1040V)
g.	104	2.5 vdc PCM bias (GG1110V)
h.	106	3200 cps 28 volt supply (GG1331V)
i.	113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

23. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR

c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR
i. VERB 21 NOUN 01 ENTR
j. 00403 ENTR
k. 00000 ENTR
l. NOUN 15 ENTR
m. 00000 ENTR ENTR
n. 00000 ENTR ENTR
o. 00000 ENTR ENTR
p. 00000 ENTR ENTR
q. 00000 ENTR

24. Set switches on Signal Generator as follows:

a. RANGE to X.01
b. FREQUENCY meter to 6.0
c. FUNCTION to SQUARE
d. DC BALANCE to midposition
e. AMPLITUDE to 70.

25. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

26. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 3200.

27. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

28. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error signal on PAVM. (Input to SCA.)

29. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).

30. Set Test Selector panel to 137.

31. Press to light TEST START pushbutton.

31A. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.

31B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

31C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input).

31D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

32. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

33. Calculate IG servo error SCA output to IG servo error SCA input as follows.

Record result:

IG servo error =

$$\frac{\text{Step 31, max meter spread}}{\text{Step 29, max meter spread}} = 0.91\ (\pm 15\%)$$

34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.

35. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).

36. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

37. Set Test Selector panel to 138.

37A. Press to light TEST START pushbutton.

37B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

37C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

37D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

37E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

38. Calculate MG servo error SCA output to MG servo error SCA input as follows. Record result.

MG servo error =

$$\frac{\text{Step 37, max meter spread}}{\text{Step 35, max meter spread}} = 0.91\ (\pm 15\%)$$

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.

40. Connect decade inductance to PSA TPA test points TB5-31 (high) and TB5-40 (low).

41. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

42. Set Test Selector panel to 139.

42A. Press to light TEST START pushbutton.

42B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

42C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

42D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

42E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

43. Calculate OG servo error SCA output to OG servo error SCA input as follows: Record result.

OG servo error =

$$\frac{\text{Step 42, max meter spread}}{\text{Step 40, max meter spread}} = 0.91\ (\pm 15\%)$$

44. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, GG2140C, AND GG2170C)

*45. Insure that AMPLITUDE control on Signal Generator is set to 0.

*46. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.

*47. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

*48. Insure that CH6DC indicator is lighted.

*49. Zero Oscillograph channel 6 and set sensitivity to 0.2 V/CM. Set sensitivity of channel 8 to 2 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*50. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*51. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*52. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

*53. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

*54. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (Input to SCA.)

*55. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (Output of SCA.)

*56. Press to light TEST START pushbutton.

*57. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*58. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*59. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*60. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*61. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (Input to SCA.)

*62. Press to light TEST START pushbutton.

*63. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*64. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*65. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*66. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*67. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (Input to SCA.)

*68. Press to light TEST START pushbutton.

*69. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*70. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*71. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, GG2250, AND GG2280)

*72. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +00000 ENTR

*73. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*74. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 00370 ENTR
c. 16002 ENTR
d. VERB 57 ENTR
e. 00003 ENTR
f. Observe:
VERB 06 NOUN 61 Flashing
g. VERB 21 ENTR
h. +00000 ENTR
i. VERB 22 ENTR
j. Site Latitude ENTR
(from Table II)
k. VERB 33 ENTR

l. 00004 ENTR
m. 00001 ENTR
n. Observe:
VERB 21 NOUN 22 Flashing
o. +00100 ENTR
p. Observe:
VERB 22 NOUN 22 Flashing
q. +00100 ENTR
r. Observe:
VERB 23 NOUN 22 Flashing
s. +00100 ENTR

Table II

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.524
NAA	+33.921

*75. Within 10 to 90 seconds after performance of step 74.s, perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 00000 ENTR
d. VERB 16 NOUN 20 ENTR

*76. Record DSKY Row 1, Row 2, and Row 3 indications.

*77. Approximately 120 seconds after performance of step 76, record DSKY Row 1, Row 2, and Row 3 indications.

*78. Set Test Selector panel to 145 and CROSSBAR CONTROL on Primary Signal Selector panel to 271. Record R&D 2.5 vdc bias voltage indicated on DVM.

*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)

*80. Set Test Selector panel to 140 to monitor IG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 81 will vary.

*81. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*82. Calculate SCA output IG CDU fine error to SCA input IG CDU fine error as follows. Record result:

IG CDU fine error =

$$\frac{\text{Step 81 (vdc) - Step 78}}{\text{2.00 x Step 81 (vac)}} = 1\ (\pm 20\%)$$

*83. Connect PSA TPA buffered probes to TB3-38 (high) and TB3-34 (low) to monitor MG CDU fine error signal on PAVM. (Input to SCA.)

*84. Set Test Selector panel to 141 to monitor MG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 85 will vary.

*85. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*86. Calculate SCA output MG CDU fine error to SCA input MG CDU fine error as follows. Record result:

MG CDU fine error =

$$\frac{\text{Step 85 (vdc) - Step 78}}{\text{2.00 x Step 85 (vac)}} = 1\ (\pm 20\%)$$

*87. Connect PSA TPA buffered probes to TB3-41 (high) and TB3-34 (low) to monitor OG CDU fine error signal on PAVM. (Input to SCA.)

*88. Set Test Selector panel to 142 to monitor OG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 89 will vary.

*89. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*90. Calculate SCA output OG CDU fine error to SCA input OG CDU fine error as follows. Record result:

OG CDU fine error =

$$\frac{\text{Step 89 (vdc) - Step 78}}{\text{2.00 x Step 89 (vac)}} = 1\ (\pm 20\%)$$

*91. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 02512 ENTR
c. 77776 ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, GG2151, AND GG 2181)

*92. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +01000 ENTR

*93. Enter VERB 16 NOUN 20 into DSKY and press ENTR pushbutton. Verify that Row 1, Row 2, and Row 3 indicate approximately +01000.

*94. Set Test Selector panel to 203 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

*95. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*96. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record results:

OG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 94 - Step 22.g)}}{\text{Step 95}} = 1\ (\pm 10\%)$$

*97. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*98. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 204. Measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

*99. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record results:

IG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 98 - Step 22.g)}}{\text{Step 97}} = 1\ (\pm 10\%)$$

*100. Set Test Selector panel to 205 and measure and record MG 1X resolver sin voltage indicated on DVM. (Ouput of SCA.)

*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*102. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record results:

MG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 100 - Step 22.g)}}{\text{Step 101}} = 1\ (\pm 10\%)$$

IG, MG, AND OG 1X RESOLVER SIN AND COS

103. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +04500 ENTR
h. VERB 16 NOUN 20 ENTR

104. Record DSKY Row 1, Row 2, and Row 3 indications.

105. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

106. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

107. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 106 - Step 22.g)}}{\text{Step 105}} = 1\ (\pm 10\%)$$

108. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

109. Set CROSSBAR CONTROL on Primary Signal Selector panel to 242 and measure and record MG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

110. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record results:

MG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 108 - Step 22.g)}}{\text{Step 109}} = 1\ (\pm 10\%)$$

111. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

112. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test

Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

113. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 112 - Step 22.g)}}{\text{Step 111}} = 1\ (\pm 10\%)$$

114. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

115. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

116. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 114 - Step 22.g}}{\text{Step 115}} = 1\ (\pm 10\%)$$

117. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

118. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

119. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 118 - Step 22.g)}}{\text{Step 117}} = 1\ (\pm 10\%)$$

120. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

121. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

122. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 120 - Step 22.g)}}{\text{Step 121}} = 1\ (\pm 10\%)$$

123. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe:
VERB 21 NOUN 22 Flashing
c. +13500 ENTR
d. Observe:
VERB 22 NOUN 22 Flashing
e. +13500 ENTR
f. Observe:
VERB 23 NOUN 22 Flashing
g. +13500 ENTR
h. Observe:
GIMBAL LOCK Lighted
i. VERB 16 NOUN 20 ENTR

124. Record DSKY Row 1, Row 2, and Row 3 indications.

125. Repeat steps 105 and 106.

126. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:
IG 1X resolver cos (135°) =
$\frac{8.5\,[\text{Step 125 (106)} - \text{Step 22.g}]}{\text{Step 125 (105)}} = -1\ (\pm 10\%)$

127. Repeat steps 108 and 109.

128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:
MG 1X resolver cos (135°) =
$\frac{8.5\,[\text{Step 127 (108)} - \text{Step 22.g}]}{\text{Step 127 (109)}} = -1\ (\pm 10\%)$

129. Repeat steps 111 and 112.

130. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:
OG 1X resolver cos (135°) =
$\frac{8.5\,[\text{Step 129 (112)} - \text{Step 22.g}]}{\text{Step 129 (111)}} = -1\ (\pm 10\%)$

131. Repeat steps 114 and 115.

132. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:
IG 1X resolver sin (135°) =
$\frac{8.5\,[\text{Step 131 (114)} - \text{Step 22.g}]}{\text{Step 131 (115)}} = 1\ (\pm 10\%)$

133. Repeat steps 117 and 118.

134. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:
MG 1X resolver sin (135°) =
$\frac{8.5\,[\text{Step 133 (118)} - \text{Step 22.g}]}{\text{Step 133 (117)}} = 1\ (\pm 10\%)$

135. Repeat steps 120 and 121.

136. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:
OG 1X resolver sin (135°) =
$\frac{8.5\,[\text{Step 135 (120)} - \text{Step 22.g}]}{\text{Step 135 (121)}} = 1\ (\pm 10\%)$

137. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +22500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +22500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +22500		ENTR
h. VERB 16	NOUN 20	ENTR

138. Record DSKY Row 1, Row 2, and Row 3 indications.

139. Repeat steps 105 and 106.

140. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:
IG 1X resolver cos (225°) =
$\frac{8.5\,[\text{Step 139 (106)} - \text{Step 22.g}]}{\text{Step 139 (105)}} = -1\ (\pm 10\%)$

141. Repeat steps 108 and 109.

142. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:
MG 1X resolver cos (225°) =
$\frac{8.5\,[\text{Step 141 (108)} - \text{Step 22.g}]}{\text{Step 141 (109)}} = -1\ (\pm 10\%)$

143. Repeat steps 111 and 112.

144. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:
OG 1X resolver cos (225°)
$\frac{8.5\,[\text{Step 143 (112)} - \text{Step 22.g}]}{\text{Step 143 (111)}} = -1\ (\pm 10\%)$

145. Repeat steps 114 and 115.

146. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:
IG 1X resolver sin (225°) =
$\frac{8.5\,[\text{Step 145 (114)} - \text{Step 22.g}]}{\text{Step 145 (115)}} = -1\ (\pm 10\%)$

147. Repeat steps 117 and 118.

148. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:
MG 1X resolver sin (225°) =
$\frac{8.5\,[\text{Step 147 (118)} - \text{Step 22.g}]}{\text{Step 147 (117)}} = -1\ (\pm 10\%)$

149. Repeat steps 120 and 121.

150. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows: Record result:
OG 1X resolver sin (225°) =
$\frac{8.5\,[\text{Step 149 (120)} - \text{Step 22.g}]}{\text{Step 149 (121)}} = -1\ (\pm 10\%)$

151. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +31500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +31500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +31500		ENTR
h. VERB 16	NOUN 20	ENTR

152. Record DSKY Row 1, Row 2, and Row 3 indications.

153. Repeat steps 105 and 106.

154. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:
IG 1X resolver cos (315°) =
$\frac{8.5\,[\text{Step 153 (106)} - \text{Step 22.g}]}{\text{Step 153 (105)}} = 1\ (\pm 10\%)$

155. Repeat steps 108 and 109.

156. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:
MG 1X resolver cos (315°) =
$\frac{8.5\,[\text{Step 155 (108)} - \text{Step 22.g}]}{\text{Step 155 (109)}} = 1\ (\pm 10\%)$

157. Repeat steps 111 and 112.

158. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:
OG 1X resolver cos (315°) =
$\frac{8.5\,[\text{Step 157 (112)} - \text{Step 22.g}]}{\text{Step 157 (111)}} = 1\ (\pm 10\%)$

159. Repeat steps 114 and 115.

160. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as

follows. Record result:
IG 1X resolver sin (315°) =
$\frac{8.5\,[\text{Step 159 (114)} - \text{Step 22.g}]}{\text{Step 159 (115)}} = -1\ (\pm 10\%)$

161. Repeat steps 117 and 118.

162. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:
MG 1X resolver sin (315°) =
$\frac{8.5\,[\text{Step 161 (118)} - \text{Step 22.g}]}{\text{Step 161 (117)}} = -1\ (\pm 10\%)$

163. Repeat steps 120 and 121.

164. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:
OG 1X resolver sin (315°) =
$\frac{8.5\,[\text{Step 163 (120)} - \text{Step 22.g}]}{\text{Step 163 (121)}} = -1\ (\pm 10\%)$

165. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR

RR SHAFT AND TRUNNION FINE ERROR

166. Prepare Resolver Circuit Tester (RCT) as follows:

a. Set Decade Error Bridge (DEB) panel switches and controls to OFF, minimum, or zero.

b. Connect cable W172 to GSE distribution box (GDB).

c. Connect RCT power cable to facility 115 vac power.

d. Connect jumper from DEB panel OUTPUT jacks to SIGNAL INPUT jacks.

e. Set 800~ REFERENCE INPUT VOLTAGE switch to 26V. POWER indicator shall light.

f. Press POWER ON pushbutton on RCT Control panel. POWER ON, READ MODE, and MON COARSE or MON FINE indicators shall light.

g. Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.

h. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

i. Insure that MON COARSE indicator is lighted.

j. Set REFERENCE QUADRANT VERNIER control to 0° and REFERENCE QUADRANT switch to 0°-90°.

k. Set DEGREES dials to 0+00.000.

l. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).

m. Press MON COARSE/MON FINE pushbutton. MON FINE indicator shall light.

n. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).

o. Press MON COARSE/MON FINE pushbutton. MON COARSE indicator shall light. Null meter shall deflect right (+). If null meter does not deflect right, repeat steps B.166.l through B.166.o.

p. Set REFERENCE QUADRANT switch to 90°-180° and set DEGREES dials to 90+00.000 to reduce sensitivity.

q. Null meter using REFERENCE QUADRANT VERNIER control. Leave REFERENCE QUADRANT VERNIER control in this position for all following tests.

r. Set REFERENCE QUADRANT switch to 0°-90°.

*167. Set RESOLVER ANGLE TRANSMITTER control to 0.

*168. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*169. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light.

*170. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 171 through 179. Ignore lamp indications.

*171. Perform following DSKY operations:

a. VERB 40	NOUN 40	ENTR
b. VERB 21	NOUN 10	ENTR
c. 00012		ENTR
d. 00011		ENTR

*172. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (high) and TB3-34 (low) and connecting jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

*173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication.

*174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication.

*175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light.

*176. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high).

*178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication.

*179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication.

*180. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 181 through 194.

181. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 40 ENTR

182. Set following switches on DEB and RCT Control panels:

a. DEB - REFERENCE QUADRANT to 0°-90°.
b. DEB - SENSITIVITY fully CCW.
c. RCT - Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.
d. RCT - SET MODE lighted.
e. DEB - DEGREES to 0+45.000.
f. RCT - MON COARSE lighted.
g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.
h. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE control to null meter.
i. DEB - SENSITIVITY fully CCW.
j. RCT - MON FINE lighted.
k. DEB - DEGREES to 0+00.000.
l. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE and FINE controls to null meter.
m. DEB - SENSITIVITY fully CCW.
n. RCT - Insure that IG, MG, and OG SELECT are not lighted.

183. Press TRUN SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

184. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 04500 and Row 2 indicates approximately 00000

185. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

186. Set Test Selector panel to 128. Measure and record trunnion 1X resolver sin voltage output from SCA on DVM.

187. Set Test Selector panel to 131. Measure and record trunnion 1X resolver cos voltage output from SCA on DVM.

188. Press SHAFT SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

189. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 00000 and Row 2 indicates approximately 04500.

190. Set Test Selector panel to 129. Measure and record shaft 1X resolver sin voltage output from SCA on DVM.

191. Set Test Selector panel to 130. Measure and record shaft 1X resolver cos voltage output from SCA on DVM.

192. Set RESOLVER ANGLE TRANSMITTER control to 0.

193. Set 800~ REFERENCE INPUT VOLTAGE switch on DEB to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

194. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during performance of step 195. Ignore lamp indication.

195. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR
d. VERB 43 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +01600 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +01600 ENTR
i. Observe:
VERB 23 NOUN 22 Flashing
j. +01600 ENTR

196. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

197. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record yaw attitude error total voltage indicated on PAVM. (Input to SCA.)

198. Set Test Selector panel to 114 and measure and record yaw attitude error voltage indicated on DVM. (Output of SCA.)

199. Calculate SCA output yaw attitude error to SCA input yaw attitude error as follows. Record result:

Yaw attitude error =

$$\frac{2.44\ (\text{Step 198} - \text{Step 22.g})}{\text{Step 197}} = 1\ (\pm 10\%)$$

200. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record pitch attitude error total voltage indicated on PAVM. (Input to SCA.)

201. Set Test Selector panel to 115 and measure and record pitch attitude error voltage indicated on DVM. (Output of SCA.)

202. Calculate SCA output pitch attitude error to SCA input pitch attitude error as

follows. Record result:

Pitch attitude error =

$$\frac{2.44\ (\text{Step 201} - \text{Step 22.g})}{\text{Step 200}} = 1\ (\pm 10\%)$$

203. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record roll attitude error total voltage indicated on PAVM. (Input to SCA.)

204. Set Test Selector panel to 116 and measure and record roll attitude error voltage indicated on DVM. (Output of SCA.)

205. Calculate SCA output roll attitude error to SCA input roll attitude error as follows. Record result:

Roll attitude error =

$$\frac{2.44\ (\text{Step 204} - \text{Step 22.g})}{\text{Step 203}} = 1\ (\pm 10\%)$$

206. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

207. Press POWER ON pushbutton on RCT Control panel. The pushbutton shall extinguish.

208. Disconnect cable W172 from GDB.

209. If additional G & N System testing is to be performed, down mode the G & N System to OIA ON mode in accordance with JDC 12614 and remove cable W157 from SCM breakout box and from cable W142. Reconnect cable W142 to SCM breakout box.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 19

NO. 12620 JDC
REV K
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE
NAME _____ SER. NO. ____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A. 8	Bus voltage	vdc	27.00		29.00		
B. 2	28 vdc LGC operate	vdc	3.9		4.8		
B. 3	28 vdc IMU standby	vdc	3.9		4.8		
B. 12	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 14 (B. 12)	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 20	Bus voltage	vdc	27.75		28.25		
B. 22. a	*Cal Mod Temp	vdc	0.40		1.26		
B. 22. b	*R&D 2.5 vdc bias	vdc	2.47		2.53		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 22. c	*IMU heater current	vdc	3. 9		4. 8		
B. 22. d	PIPA Temp	vdc	2. 0		3. 0		
B. 22. c	*IRIG Temp	vdc	2. 37		3. 70		
B. 22. f	120 vdc reference	vdc	2. 80		4. 20		
B. 22. g	2. 5 vdc PCM bias	vdc	2. 47		2. 53		
B. 22. h	3200 cps, 28v supply	vdc	4. 20		4. 80		
B. 22. i	800 cps, 28v supply	vdc	4. 20		4. 80		
B. 31C	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (IG servo error, SCA input)	vac					
B. 31D	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (IG servo error, SCA output)	vdc					
B. 33	IG servo error		0. 77		1. 05		
B. 37C	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (MG servo error, SCA input)	vac					

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 37D	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (MG servo error, SCA output)	vdc					
B. 38	MG servo error		0. 77		1. 05		
B. 42C	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (OG servo error, SCA input)	vac					
B. 42D	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (OG servo error, SCA output)	vdc					
B. 43	OG servo error		0. 77		1. 05		
B. 59	*IG TMC (Channel 6)	v p-p					
	*IG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%		
B. 65	*MG TMC (Channel 6)	v p-p					
	*MG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%		

DATE 26 JAN 67

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 71	*OG TMC (Channel 6)	v p-p					
	*OG TMC (Channel 8)	v p-p	Channel 6 x 2. 75 -15%		Channel 6 x 2. 75 +15%		
B. 76	*Row 1	deg					
	*Row 2	deg					
	*Row 3	deg					
B. 77	*Row 1	deg					
	*Row 2	deg					
	*Row 3	deg					
B. 78	*R&D 2. 5 vdc bias	vdc					
B. 81	*IG CDU fine error (PAVM)	vac					
	*IG CDU fine error (DVM)	vdc					
B. 82	*IG CDU fine error		0. 80		1. 20		
B. 85	*MG CDU fine error (PAVM)	vac					
	*MG CDU fine error (DVM)	vdc					
B. 86	*MG CDU fine error		0. 80		1. 20		
B. 89	*OG CDU fine error (PAVM)	vac					
	*OG CDU fine error (DVM)	vdc					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 90	*OG CDU fine error		0. 80		1. 20		
B. 94	*OG 1X resolver	vdc					
B. 95	*OG 1X resolver	vac					
B. 96	*OG 1X resolver		0. 90		1. 10		
B. 97	*IG 1X resolver	vac					
B. 98	*IG 1X resolver	vdc					
B. 99	*IG 1X resolver		0. 90		1. 10		
B. 100	*MG 1X resolver	vdc					
B. 101	*MG 1X resolver	vac					
B. 102	*MG 1X resolver		0. 90		1. 10		
B. 104	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 105	IG 1X resolver cos	vac					
B. 106	IG 1X resolver cos	vdc					
B. 107	IG 1X resolver cos (45°)		0. 90		1. 10		
B. 108	MG 1X resolver cos	vdc					
B. 109	MG 1X resolver cos	vac					
B. 110	MG 1X resolver cos (45°)		0. 90		1. 10		
B. 111	OG 1X resolver cos	vac					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 112	OG 1X resolver cos	vdc					
B. 113	OG 1X resolver cos (45°)		0.90		1.10		
B. 114	IG 1X resolver sin	vdc					
B. 115	IG 1X resolver sin	vac					
B. 116	IG 1X resolver sin (45°)		0.90		1.10		
B. 117	MG 1X resolver sin	vac					
B. 118	MG 1X resolver sin	vdc					
B. 119	MG 1X resolver sin (45°)		0.90		1.10		
B. 120	OG 1X resolver sin	vdc					
B. 121	OG 1X resolver sin	vac					
B. 122	OG 1X resolver sin (45°)		0.90		1.10		
B. 124	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 125 (B. 105)	IG 1X resolver cos	vac					
B. 125 (B. 106)	IG 1X resolver cos	vdc					
B. 126	IG 1X resolver cos (135°)		-0.90		-1.10		
B. 127 (B. 108)	MG 1X resolver cos	vdc					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 127 (B. 109)	MG 1X resolver cos	vac					
B. 128	MG 1X resolver cos (135°)		-0.90		-1.10		
B. 129 (B. 111)	OG 1X resolver cos	vac					
B. 129 (B. 112)	OG 1X resolver cos	vdc					
B. 130	OG 1X resolver cos (135°)		-0.90		-1.10		
B. 131 (B. 114)	IG 1X resolver sin	vdc					
B. 131 (B. 115)	IG 1X resolver sin	vac					
B. 132	IG 1X resolver sin (135°)		0.90		1.10		
B. 133 (B. 117)	MG 1X resolver sin	vac					
B. 133 (B. 118)	MG 1X resolver sin	vdc					
B. 134	MG 1X resolver sin (135°)		0.90		1.10		
B. 135 (B. 120)	OG 1X resolver sin	vdc					
B. 135 (B. 121)	OG 1X resolver sin	vac					
B. 136	OG 1X resolver sin (135°)		0.90		1.10		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 138	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 139 (B. 105)	IG 1X resolver cos	vac					
B. 139 (B. 106)	IG 1X resolver cos	vdc					
B. 140	IG 1X resolver cos (225°)		-0.90		-1.10		
B. 141 (B. 108)	MG 1X resolver cos	vdc					
B. 141 (B. 109)	MG 1X resolver cos	vac					
B. 142	MG 1X resolver cos (225°)		-0.90		-1.10		
B. 143 (B. 111)	OG 1X resolver cos	vac					
B. 143 (B. 112)	OG 1X resolver cos	vdc					
B. 144	OG 1X resolver cos (225°)		-0.90		-1.10		
B. 145 (B. 114)	IG 1X resolver sin	vdc					
B. 145 (B. 115)	IG 1X resolver sin	vac					
B. 146	IG 1X resolver sin (225°)		-0.90		-1.10		

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EQUIPMENT TEST
DATA SHEET 9 OF 19

JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 147 (B. 117)	MG 1X resolver sin	vac					
B. 147 (B. 118)	MG 1X resolver sin	vdc					
B. 148	MG 1X resolver sin (225°)		-0.90		-1.10		
B. 149 (B. 120)	OG 1X resolver sin	vdc					
B. 149 (B. 121)	OG 1X resolver sin	vac					
B. 150	OG 1X resolver sin (225°)		-0.90		-1.10		
B. 152	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 153 (B. 105)	IG 1X resolver cos	vac					
B. 153 (B. 106)	IG 1X resolver cos	vdc					
B. 154	IG 1X resolver cos (315°)		0.90		1.10		
B. 155 (B. 108)	MG 1X resolver cos	vdc					
B. 155 (B. 109)	MG 1X resolver cos	vac					
B. 156	MG 1X resolver cos (315°)		0.90		1.10		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 157 (B. 111)	OG 1X resolver cos	vac					
B. 157 (B. 112)	OG 1X resolver cos	vdc					
B. 158	OG 1X resolver cos (315°)		0.90		1.10		
B. 159 (B. 114)	IG 1X resolver sin	vdc					
B. 159 (B. 115)	IG 1X resolver sin	vac					
B. 160	IG 1X resolver sin (315°)		-0.90		-1.10		
B. 161 (B. 117)	MG 1X resolver sin	vac					
B. 161 (B. 118)	MG 1X resolver sin	vdc					
B. 162	MG 1X resolver sin (315°)		-0.90		-1.10		
B. 163 (B. 120)	OG 1X resolver sin	vdc					
B. 163 (B. 121)	OG 1X resolver sin	vac					
B. 164	OG 1X resolver sin (315°)		-0.90		-1.10		
B. 173	*Shaft CDU fine error	vdc	2.45		2.55		

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 174	*Shaft CDU fine error	vdc	3.75		4.25		
B. 178	*Trunnion CDU fine error	vdc	3.75		4.25		
B. 179	*Trunnion CDU fine error	vdc	2.45		2.55		
B. 186	Trunnion 1X resolver sin	vdc	4.45		4.95		
B. 187	Trunnion 1X resolver cos	vdc	4.45		4.95		
B. 190	Shaft 1X resolver sin	vdc	4.45		4.95		
B. 191	Shaft 1X resolver cos	vdc	4.45		4.95		
B. 197	Yaw attitude error	vac					
B. 198	Yaw attitude error	vdc					
B. 199	Yaw attitude error		0.90		1.10		
B. 200	Pitch attitude error	vac					
B. 201	Pitch attitude error	vdc					
B. 202	Pitch attitude error		0.90		1.10		
B. 203	Roll attitude error	vac					
B. 204	Roll attitude error	vdc					
B. 205	Roll attitude error		0.90		1.10		

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 33	IG Servo Error = $\frac{\text{SCA output (Step 31, Maximum Meter Spread)}}{\text{SCA input (Step 29, Maximum Meter Spread)}}$ = 0.91 (±15%)
B. 38	MG Servo Error = $\frac{\text{SCA output (Step 37, Maximum Meter Spread)}}{\text{SCA input (Step 35, Maximum Meter Spread)}}$ = 0.91 (±15%)
B. 43	OG Servo Error = $\frac{\text{SCA output (Step 42, Maximum Meter Spread)}}{\text{SCA input (Step 40, Maximum Meter Spread)}}$ = 0.91 (±15%)
B. 82	*IG CDU Fine Error = $\frac{\text{SCA output (Step 81, vdc) - 2.5V R\&D Bias (Step 78)}}{\text{2.00 x SCA input (Step 81, vac)}}$ = 1 (±20%)
B. 86	*MG CDU Fine Error = $\frac{\text{SCA output (Step 85, vdc) - 2.5V R\&D Bias (Step 78)}}{\text{2.00 x SCA input (Step 85, vac)}}$ = 1 (±20%)

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 90	*OG CDU Fine Error = $\frac{\text{SCA output (Step 89, vdc) - 2.5V R\&D Bias (Step 78)}}{\text{2.00 x SCA input (Step 89, vac)}}$ = 1 (±20%)
B. 96	*OG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 94) - 2.5V PCM Bias (Step 22.g)]}}{\text{SCA input (Step 95)}}$ = 1 (±10%)
B. 99	*IG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 98) - 2.5V PCM Bias (Step 22.g)]}}{\text{SCA input (Step 97)}}$ = 1 (±10%)
B. 102	*MG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 100) - 2.5V PCM Bias (Step 22.g)]}}{\text{SCA input (Step 101)}}$ = 1 (±10%)
B. 107	IG 1X Resolver Cos (45°) = $\frac{\text{8.5 x [SCA output (Step 106) - 2.5V PCM Bias (Step 22.g)]}}{\text{SCA Input (Step 105)}}$ = 1 (±10%)

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 110	MG 1X Resolver Cos (45°) = $\frac{8.5 \times [\text{SCA output (Step 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 109)}}$ = 1 (±10%)
B. 113	OG 1X Resolver Cos (45°) = $\frac{8.5 \times [\text{SCA Output (Step 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 111)}}$ = 1 (±10%)
B. 116	IG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 115)}}$ = 1 (±10%)
B. 119	MG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 117)}}$ = 1 (±10%)
B. 122	OG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 121)}}$ = 1 (±10%)

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 126	IG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 125, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 125, 105)}}$ = -1 (±10%)
B. 128	MG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 127, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 127, 109)}}$ = -1 (±10%)
B. 130	OG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 129, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 129, 111)}}$ = -1 (±10%)
B. 132	IG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 131, 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 131, 115)}}$ = 1 (±10%)
B. 134	MG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 133, 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 133, 117)}}$ = 1 (±10%)

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 136	OG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 135, 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 135, 121)}}$ = 1 (±10%)
B. 140	IG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 139, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 139, 105)}}$ = -1 (±10%)
B. 142	MG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 141, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 141, 109)}}$ = -1 (±10%)
B. 144	OG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 143, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 143, 111)}}$ = -1 (±10%)
B. 146	IG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 145, 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 145, 115)}}$ = -1 (±10%)

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 148	MG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 147, 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 147, 117)}}$ = -1 (±10%)
B. 150	OG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 149, 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 149, 121)}}$ = -1 (±10%)
B. 154	IG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 153, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 153, 105)}}$ = 1 (±10%)
B. 156	MG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 155, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 155, 109)}}$ = 1 (±10%)
B. 158	OG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 157, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 157, 111)}}$ = 1 (±10%)

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 160	IG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 159, 114)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 159, 115)}} = -1\ (\pm 10\%)$
B. 162	MG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 161, 118)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 161, 117)}} = -1\ (\pm 10\%)$
B. 164	OG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 163, 120)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 163, 121)}} = -1\ (\pm 10\%)$
B. 199	Yaw Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 198)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 197)}} = 1\ (\pm 10\%)$
B. 202	Pitch Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 201)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 200)}} = 1\ (\pm 10\%)$

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JDC NO. 12620 REV. K

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 205	Roll Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 204)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 203)}} = 1\ (\pm 10\%)$

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DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-24-67	34449	All	All	EA	-
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA	-
C	10-10-67	34802	12	-	EA	-
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA	-
E	2-6-68	35561	7, 12, 13	3	EA	-
F	3-28-68	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA	-
G	7-25-68	36586	1, 9, 10, 12	-	EA	-
H	9-26-68	36861	1	-	EA	-
J	12-2-68	37073	All	All	EA	-
K	2-24-69	37363	1, 2, 5, 6, 19	1, 2, 3	EA	-
L	5-26-70	38142	1, 2, 19	-	EA	-

REFERENCES
PS 6015000
JDC 12614
JDC 18100

IMPORTANT
See below

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010. 3. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

NOTE: If VERB display on DSKY contains a number from 11 to 17, KEY REL indicator may flash when DSKY entries are made.

A. PREPARATION

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

NOTE: If SCA has been previously installed in system configuration prior to performance of this JDC, proceed with step A.7; if installation is required, proceed with step A.2.

2. Remove DSKY Mounting Pedestal

and DSKY from Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Connnect cable W157-P1 to 30J2 on SCM breakout box and W157-P2 to P1 on cable W142. Insure that all other cables are connected to the SCM as shown in JDC 12609.

7A. Perform JDC 12614 to place G and N system in ISS STANDBY mode with LGC operating.

NOTE: The 28 VDC G&N Power adjusted in step 8 will vary as result of heater cycling.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 120 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

9. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and Standby Requirements of JDC 12614 have been satisfied.

10. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE indicator shall light.

NOTE: Step 11 applies only when Restart Monitor module is installed.

11. Set contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR
b. 00077 ENTR
c. 00000 ENTR
d. Press RSET pushbutton.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2

ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to 101 to measure and record 28 vdc LGC operate voltage (GG1523X) on DVM.

3. Set Test Selector panel to 102 to measure and record 28 vdc IMU standby voltage (GG1513X) on DVM.

PIPA S/G OUTPUT

4. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
CHANNEL 8 to 4	SCA GDB stepper switch

5. Insure that CH4AC, CH5AC, and CH6AC pushbuttons are lighted.

6. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity on channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

7. Perform the following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
Observe:
VERB 21 NOUN 22 Flashing
c. +00000 ENTR
Observe:
VERB 22 NOUN 22 Flashing
d. -04500 ENTR
Observe:
VERB 23 NOUN 22 Flashing
e. +03500 ENTR

8. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 9 through 12 successively for each Test Selector panel position listed in Table I.

9. Set Test Selector panel to position listed in Table I.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 11.

11. Perform the following DSKY operation:
VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase out.
118	Y PIPA G/S in-phase out.
119	X PIPA G/S in-phase out.

12. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

13. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR
Observe:
VERB 21 NOUN 22 Flashing
b. +00000 ENTR
Observe:
VERB 22 NOUN 22 Flashing
c. -22500 ENTR
Observe:
VERB 23 NOUN 22 Flashing
d. -03500 ENTR

14. Repeat steps 9 through 12 then set all Oscillograph Amplifier sensitivities to OFF.

15. through 19. (Deleted)

20. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

21. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

22. Set Test Selector panel to positions listed below and measure and record DVM indication for each position:

NOTE: SCA TEST TMC INHIBIT indicator on Temperature Monitor Control panel will illuminate when Test Selector panel is set to positions 201 and 202. Following measurements in these positions, press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that above inhibit indicator extinguishes.

Test	Test Selector Panel Position	Signal
a.	*135	Cal Mod Temperature (GG6020T)
b.	*145	R&D vdc bias (GG1111V)
c.	*150	IMU Heater Current (GG2302X)
d.	201	PIPA Temperature (GG2300T)
e.	*202	IRIG Temperature (GG2301T)
f.	103	120 vdc ref. (GG1040V)
g.	104	2.5 vdc PCM bias (GG1110V)
h.	106	3200 cps 28 volt supply (GG1331V)
i.	113	800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

23. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR

c. Observe:

VERB 21	NOUN 22	Flashing
d. +00000		ENTR

e. Observe:

VERB 22	NOUN 22	Flashing
f. +00000		ENTR

g. Observe:

VERB 23	NOUN 22	Flashing
h. +00000		ENTR
i. VERB 21	NOUN 01	ENTR
j. 00403		ENTR
k. 00000		ENTR
l. NOUN 15		ENTR
m. 00000		ENTR ENTR
n. 00000		ENTR ENTR
o. 00000		ENTR ENTR
p. 00000		ENTR ENTR
q. 00000		ENTR

24. Set switches on Signal Generator as follows:

a. RANGE to X.01
b. FREQUENCY meter to 6.0
c. FUNCTION to SQUARE
d. DC BALANCE to midposition
e. AMPLITUDE to 70.

25. Perform following DSKY operations:

a. VERB 42	ENTR
b. VERB 33	ENTR

26. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 3200.

27. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

28. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error signal on PAVM. (Input to SCA.)

29. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).

30. Set Test Selector panel to 137.

31. Press to light TEST START pushbutton.

31A. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.

31B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

31C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input).

31D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

32. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

33. Calculate IG servo error SCA output to IG servo error SCA input as follows.

Record result:

IG servo error =

$$\frac{\text{Step 31, max meter spread}}{\text{Step 29, max meter spread}} = 0.91\ (\pm 15\%)$$

34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.

35. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).

36. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.

37. Set Test Selector panel to 138.

37A. Press to light TEST START pushbutton.

37B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

37C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

37D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

37E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

38. Calculate MG servo error SCA output to MG servo error SCA input as follows. Record result.

MG servo error =

$$\frac{\text{Step 37, max meter spread}}{\text{Step 35, max meter spread}} = 0.91\ (\pm 15\%)$$

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.

40. Connect decade inductance to PSA TPA test points TB5-31 (high) and TB5-40 (low).

41. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.

42. Set Test Selector panel to 139.

42A. Press to light TEST START pushbutton.

42B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.

42C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)

42D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)

42E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

43. Calculate OG servo error SCA output to OG servo error SCA input as follows: Record result.

OG servo error =

$$\frac{\text{Step 42, max meter spread}}{\text{Step 40, max meter spread}} = 0.91\ (\pm 15\%)$$

44. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.

*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, GG2140C, AND GG2170C)

*45. Insure that AMPLITUDE control on Signal Generator is set to 0.

*46. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.

*47. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

*48. Insure that CH6DC indicator is lighted.

*49. Zero Oscillograph channel 6 and set sensitivity to 0.2 V/CM. Set sensitivity of channel 8 to 2 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

*50. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

*51. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*52. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.

*53. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.

*54. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (Input to SCA.)

*55. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (Output of SCA.)

*56. Press to light TEST START pushbutton.

*57. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*58. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*59. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*60. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*61. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (Input to SCA.)

*62. Press to light TEST START pushbutton.

*63. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*64. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*65. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*66. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

*67. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (Input to SCA.)

*68. Press to light TEST START pushbutton.

*69. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.

*70. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.

*71. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

*IG, MG, AND OG CDU FINE ERRORS (GG2220, GG2250, AND GG2280)

*72. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR

*73. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

*74. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 00370		ENTR
c. 16002		ENTR
d. VERB 57		ENTR
e. 00003		ENTR
f. Observe:		
VERB 06	NOUN 61	Flashing
g. VERB 21		ENTR
h. +00000		ENTR
i. VERB 22		ENTR
j. Site Latitude (from Table II)		ENTR
k. VERB 33		ENTR

l. 00004		ENTR
m. 00001		ENTR
n. Observe:		
VERB 21	NOUN 22	Flashing
o. +00100		ENTR
p. Observe:		
VERB 22	NOUN 22	Flashing
q. +00100		ENTR
r. Observe:		
VERB 23	NOUN 22	Flashing
s. +00100		ENTR

Table II

Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.524
NAA	+33.921

*75. Within 10 to 90 seconds after performance of step 74.s, perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 02512		ENTR
c. 00000		ENTR
d. VERB 16	NOUN 20	ENTR

*76. Record DSKY Row 1, Row 2, and Row 3 indications.

*77. Approximately 120 seconds after performance of step 76, record DSKY Row 1, Row 2, and Row 3 indications.

*78. Set Test Selector panel to 145 and CROSSBAR CONTROL on Primary Signal Selector panel to 271. Record R&D 2.5 vdc bias voltage indicated on DVM.

*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)

*80. Set Test Selector panel to 140 to monitor IG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 81 will vary.

*81. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*82. Calculate SCA output IG CDU fine error to SCA input IG CDU fine error as follows. Record result:

IG CDU fine error =

$$\frac{\text{Step 81 (vdc) - Step 78}}{\text{2.00 x Step 81 (vac)}} = 1\ (\pm 20\%)$$

*83. Connect PSA TPA buffered probes to TB3-38 (high) and TB3-34 (low) to monitor MG CDU fine error signal on PAVM. (Input to SCA.)

*84. Set Test Selector panel to 141 to monitor MG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 85 will vary.

*85. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*86. Calculate SCA output MG CDU fine error to SCA input MG CDU fine error as follows. Record result:

MG CDU fine error =

$$\frac{\text{Step 85 (vdc) - Step 78}}{\text{2.00 x Step 85 (vac)}} = 1\ (\pm 20\%)$$

*87. Connect PSA TPA buffered probes to TB3-41 (high) and TB3-34 (low) to monitor OG CDU fine error signal on PAVM. (Input to SCA.)

*88. Set Test Selector panel to 142 to monitor OG CDU fine error signal on DVM. (Output of SCA.)

NOTE: Due to earth rate, voltages measured in step 89 will vary.

*89. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

*90. Calculate SCA output OG CDU fine error to SCA input OG CDU fine error as follows. Record result:

OG CDU fine error =

$$\frac{\text{Step 89 (vdc) - Step 78}}{\text{2.00 x Step 89 (vac)}} = 1\ (\pm 20\%)$$

*91. Perform following DSKY operations:

a. VERB 21	NOUN 01	ENTR
b. 02512		ENTR
c. 77776		ENTR

*IG, MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, GG2151, AND GG 2181)

*92. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +01000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +01000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +01000		ENTR

*93. Enter VERB 16 NOUN 20 into DSKY and press ENTR pushbutton. Verify that Row 1, Row 2, and Row 3 indicate approximately +01000.

*94. Set Test Selector panel to 203 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

*95. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*96. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record results:

OG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 94 - Step 22.g)}}{\text{Step 95}} = 1\ (\pm 10\%)$$

*97. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*98. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 204. Measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

*99. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record results:

IG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 98 - Step 22.g)}}{\text{Step 97}} = 1\ (\pm 10\%)$$

*100. Set Test Selector panel to 205 and measure and record MG 1X resolver sin voltage indicated on DVM. (Ouput of SCA.)

*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

*102. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record results:

MG 1X resolver sin ($\pm 10^{\circ}$) =

$$\frac{\text{2 (Step 100 - Step 22.g)}}{\text{Step 101}} = 1\ (\pm 10\%)$$

IG, MG, AND OG 1X RESOLVER SIN AND COS

103. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +04500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +04500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +04500		ENTR
h. VERB 16	NOUN 20	ENTR

104. Record DSKY Row 1, Row 2, and Row 3 indications.

105. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

106. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

107. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 106 - Step 22.g)}}{\text{Step 105}} = 1\ (\pm 10\%)$$

108. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

109. Set CROSSBAR CONTROL on Primary Signal Selector panel to 242 and measure and record MG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

110. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record results:

MG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 108 - Step 22.g)}}{\text{Step 109}} = 1\ (\pm 10\%)$$

111. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (Input to SCA.)

112. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test

Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (Output of SCA.)

113. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (45°) =

$$\frac{\text{8.5 (Step 112 - Step 22.g)}}{\text{Step 111}} = 1\ (\pm 10\%)$$

114. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

115. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

116. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 114 - Step 22.g}}{\text{Step 115}} = 1\ (\pm 10\%)$$

117. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

118. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

119. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 118 - Step 22.g)}}{\text{Step 117}} = 1\ (\pm 10\%)$$

120. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

121. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)

122. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin (45°) =

$$\frac{\text{8.5 (Step 120 - Step 22.g)}}{\text{Step 121}} = 1\ (\pm 10\%)$$

123. Perform following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +13500		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +13500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +13500		ENTR
h. Observe:		
GIMBAL LOCK		Lighted
i. VERB 16	NOUN 20	ENTR

124. Record DSKY Row 1, Row 2, and Row 3 indications.

125. Repeat steps 105 and 106.

126. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (135°) =

$$\frac{8.5\,[\text{Step 125 (106)} - \text{Step 22.g}]}{\text{Step 125 (105)}} = -1\ (\pm 10\%)$$

127. Repeat steps 108 and 109.

128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos (135°) =

$$\frac{8.5\,[\text{Step 127 (108)} - \text{Step 22.g}]}{\text{Step 127 (109)}} = -1\ (\pm 10\%)$$

129. Repeat steps 111 and 112.

130. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (135°) =

$$\frac{8.5\,[\text{Step 129 (112)} - \text{Step 22.g}]}{\text{Step 129 (111)}} = -1\ (\pm 10\%)$$

131. Repeat steps 114 and 115.

132. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin (135°) =

$$\frac{8.5\,[\text{Step 131 (114)} - \text{Step 22.g}]}{\text{Step 131 (115)}} = 1\ (\pm 10\%)$$

133. Repeat steps 117 and 118.

134. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin (135°) =

$$\frac{8.5\,[\text{Step 133 (118)} - \text{Step 22.g}]}{\text{Step 133 (117)}} = 1\ (\pm 10\%)$$

135. Repeat steps 120 and 121.

136. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin (135°) =

$$\frac{8.5\,[\text{Step 135 (120)} - \text{Step 22.g}]}{\text{Step 135 (121)}} = 1\ (\pm 10\%)$$

137. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+22500		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+22500		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+22500		ENTR
h.	VERB 16	NOUN 20	ENTR

138. Record DSKY Row 1, Row 2, and Row 3 indications.

139. Repeat steps 105 and 106.

140. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (225°) =

$$\frac{8.5\,[\text{Step 139 (106)} - \text{Step 22.g}]}{\text{Step 139 (105)}} = -1\ (\pm 10\%)$$

141. Repeat steps 108 and 109.

142. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos (225°) =

$$\frac{8.5\,[\text{Step 141 (108)} - \text{Step 22.g}]}{\text{Step 141 (109)}} = -1\ (\pm 10\%)$$

143. Repeat steps 111 and 112.

144. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (225°)

$$\frac{8.5\,[\text{Step 143 (112)} - \text{Step 22.g}]}{\text{Step 143 (111)}} = -1\ (\pm 10\%)$$

145. Repeat steps 114 and 115.

146. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:

IG 1X resolver sin (225°) =

$$\frac{8.5\,[\text{Step 145 (114)} - \text{Step 22.g}]}{\text{Step 145 (115)}} = -1\ (\pm 10\%)$$

147. Repeat steps 117 and 118.

148. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin (225°) =

$$\frac{8.5\,[\text{Step 147 (118)} - \text{Step 22.g}]}{\text{Step 147 (117)}} = -1\ (\pm 10\%)$$

149. Repeat steps 120 and 121.

150. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows: Record result:

OG 1X resolver sin (225°) =

$$\frac{8.5\,[\text{Step 149 (120)} - \text{Step 22.g}]}{\text{Step 149 (121)}} = -1\ (\pm 10\%)$$

151. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+31500		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+31500		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+31500		ENTR
h.	VERB 16	NOUN 20	ENTR

152. Record DSKY Row 1, Row 2, and Row 3 indications.

153. Repeat steps 105 and 106.

154. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result:

IG 1X resolver cos (315°) =

$$\frac{8.5\,[\text{Step 153 (106)} - \text{Step 22.g}]}{\text{Step 153 (105)}} = 1\ (\pm 10\%)$$

155. Repeat steps 108 and 109.

156. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result:

MG 1X resolver cos (315°) =

$$\frac{8.5\,[\text{Step 155 (108)} - \text{Step 22.g}]}{\text{Step 155 (109)}} = 1\ (\pm 10\%)$$

157. Repeat steps 111 and 112.

158. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:

OG 1X resolver cos (315°) =

$$\frac{8.5\,[\text{Step 157 (112)} - \text{Step 22.g}]}{\text{Step 157 (111)}} = 1\ (\pm 10\%)$$

159. Repeat steps 114 and 115.

160. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as

follows. Record result:

IG 1X resolver sin (315°) =

$$\frac{8.5\,[\text{Step 159 (114)} - \text{Step 22.g}]}{\text{Step 159 (115)}} = -1\ (\pm 10\%)$$

161. Repeat steps 117 and 118.

162. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:

MG 1X resolver sin (315°) =

$$\frac{8.5\,[\text{Step 161 (118)} - \text{Step 22.g}]}{\text{Step 161 (117)}} = -1\ (\pm 10\%)$$

163. Repeat steps 120 and 121.

164. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result:

OG 1X resolver sin (315°) =

$$\frac{8.5\,[\text{Step 163 (120)} - \text{Step 22.g}]}{\text{Step 163 (121)}} = -1\ (\pm 10\%)$$

165. Perform following DSKY operations:

a.	VERB 41	NOUN 20	ENTR
b.	Observe:		
	VERB 21	NOUN 22	Flashing
c.	+00000		ENTR
d.	Observe:		
	VERB 22	NOUN 22	Flashing
e.	+00000		ENTR
f.	Observe:		
	VERB 23	NOUN 22	Flashing
g.	+00000		ENTR

RR SHAFT AND TRUNNION FINE ERROR

166. Prepare Resolver Circuit Tester (RCT) as follows:

a. Set Decade Error Bridge (DEB) panel switches and controls to OFF, minimum, or zero.

b. Connect cable W172 to GSE distribution box (GDB).

c. Connect RCT power cable to facility 115 vac power.

d. Connect jumper from DEB panel OUTPUT jacks to SIGNAL INPUT jacks.

e. Set 800~ REFERENCE INPUT VOLTAGE switch to 26V. POWER indicator shall light.

f. Press POWER ON pushbutton on RCT Control panel. POWER ON, READ MODE, and MON COARSE or MON FINE indicators shall light.

g. Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.

h. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

i. Insure that MON COARSE indicator is lighted.

j. Set REFERENCE QUADRANT VERNIER control to 0° and REFERENCE QUADRANT switch to 0°-90°.

k. Set DEGREES dials to 0+00.000.

l. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).

m. Press MON COARSE/MON FINE pushbutton. MON FINE indicator shall light.

n. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).

o. Press MON COARSE/MON FINE pushbutton. MON COARSE indicator shall light. Null meter shall deflect right (+). If null meter does not deflect right, repeat steps B.166.1 through B.166.o.

p. Set REFERENCE QUADRANT switch to 90°-180° and set DEGREES dials to 90+00.000 to reduce sensitivity.

q. Null meter using REFERENCE QUADRANT VERNIER control. Leave REFERENCE QUADRANT VERNIER control in this position for all following tests.

r. Set REFERENCE QUADRANT switch to 0°-90°.

*167. Set RESOLVER ANGLE TRANSMITTER control to 0.

*168. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

*169. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light.

*170. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 171 through 179. Ignore lamp indications.

*171. Perform following DSKY operations:

a.	VERB 40	NOUN 40	ENTR
b.	VERB 21	NOUN 10	ENTR
c.	00012		ENTR
d.	00011		ENTR

*172. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (high) and TB3-34 (low) and connecting jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

*173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication.

*174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication.

*175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light.

*176. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

*177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high).

*178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication.

*179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication.

*180. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 181 through 194.

181. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 40 NOUN 40 ENTR

182. Set following switches on DEB and RCT Control panels:

a. DEB - REFERENCE QUADRANT to 0°-90°.
b. DEB - SENSITIVITY fully CCW.
c. RCT - Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.
d. RCT - SET MODE lighted.
e. DEB - DEGREES to 0+45.000.
f. RCT - MON COARSE lighted.
g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.
h. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE control to null meter.
i. DEB - SENSITIVITY fully CCW.
j. RCT - MON FINE lighted.
k. DEB - DEGREES to 0+00.000.
l. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE and FINE controls to null meter.
m. DEB - SENSITIVITY fully CCW.
n. RCT - Insure that IG, MG, and OG SELECT are not lighted.

183. Press TRUN SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

184. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 04500 and Row 2 indicates approximately 00000.

185. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

186. Set Test Selector panel to 128. Measure and record trunnion 1X resolver sin voltage output from SCA on DVM.

187. Set Test Selector panel to 131. Measure and record trunnion 1X resolver cos voltage output from SCA on DVM.

188. Press SHAFT SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

189. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 00000 and Row 2 indicates approximately 04500.

190. Set Test Selector panel to 129. Measure and record shaft 1X resolver sin voltage output from SCA on DVM.

191. Set Test Selector panel to 130. Measure and record shaft 1X resolver cos voltage output from SCA on DVM.

192. Set RESOLVER ANGLE TRANSMITTER control to 0.

193. Set 800~ REFERENCE INPUT VOLTAGE switch on DEB to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

194. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during performance of step 195. Ignore lamp indication.

195. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00060 ENTR
d. VERB 43 ENTR
e. Observe:
VERB 21 NOUN 22 Flashing
f. +01600 ENTR
g. Observe:
VERB 22 NOUN 22 Flashing
h. +01600 ENTR
i. Observe:
VERB 23 NOUN 22 Flashing
j. +01600 ENTR

196. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

197. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record yaw attitude error total voltage indicated on PAVM. (Input to SCA.)

198. Set Test Selector panel to 114 and measure and record yaw attitude error voltage indicated on DVM. (Output of SCA.)

199. Calculate SCA output yaw attitude error to SCA input yaw attitude error as follows. Record result:

Yaw attitude error =

$$\frac{2.44\ (\text{Step 198 - Step 22.g})}{\text{Step 197}} = 1\ (\pm 10\%)$$

200. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record pitch attitude error total voltage indicated on PAVM. (Input to SCA.)

201. Set Test Selector panel to 115 and measure and record pitch attitude error voltage indicated on DVM. (Output of SCA.)

202. Calculate SCA output pitch attitude error to SCA input pitch attitude error as

follows. Record result:

Pitch attitude error =

$$\frac{2.44\ (\text{Step 201 - Step 22.g})}{\text{Step 200}} = 1\ (\pm 10\%)$$

203. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record roll attitude error total voltage indicated on PAVM. (Input to SCA.)

204. Set Test Selector panel to 116 and measure and record roll attitude error voltage indicated on DVM. (Output of SCA.)

205. Calculate SCA output roll attitude error to SCA input roll attitude error as follows. Record result:

Roll attitude error =

$$\frac{2.44\ (\text{Step 204 - Step 22.g})}{\text{Step 203}} = 1\ (\pm 10\%)$$

206. Perform following DSKY operations:

a. VERB 36 ENTR
b. VERB 41 NOUN 20 ENTR
c. Observe:
VERB 21 NOUN 22 Flashing
d. +00000 ENTR
e. Observe:
VERB 22 NOUN 22 Flashing
f. +00000 ENTR
g. Observe:
VERB 23 NOUN 22 Flashing
h. +00000 ENTR

207. Press POWER ON pushbutton on RCT Control panel. The pushbutton shall extinguish.

208. Disconnect cable W172 from GDB.

NOTE: Step 208A applies only when Restart Monitor module (2898989) is installed.

208A. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00077 ENTR
c. The contents of Row 1 shall be 00000.

209. If additional G & N System testing is to be performed, down mode the G & N System to OIA ON mode in accordance with JDC 12614 and remove cable W157 from SCM breakout box and from cable W142. Reconnect cable W142 to SCM breakout box.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 19

NO. 12620 JDC
REV L
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ____ START ____ END ____ SITE/LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE
NAME _____ SER. NO. ____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A. 8	Bus voltage	vdc	27.00		29.00		
B. 2	28 vdc LGC operate	vdc	3.9		4.8		
B. 3	28 vdc IMU standby	vdc	3.9		4.8		
B. 12	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 14 (B. 12)	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 20	Bus voltage	vdc	27.75		28.25		
B. 22. a	*Cal Mod Temp	vdc	0.40		1.26		
B. 22. b	*R&D 2.5 vdc bias	vdc	2.47		2.53		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 19

JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 22. c	*IMU heater current	vdc	3. 9		4. 8		
B. 22. d	PIPA Temp	vdc	2. 0		3. 0		
B. 22. e	*IRIG Temp	vdc	2. 37		3. 70		
B. 22. f	120 vdc reference	vdc	2. 80		4. 20		
B. 22. g	2. 5 vdc PCM bias	vdc	2. 47		2. 53		
B. 22. h	3200 cps, 28v supply	vdc	4. 20		4. 80		
B. 22. i	800 cps, 28v supply	vdc	4. 20		4. 80		
B. 31C	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (IG servo error, SCA input)	vac					
B. 31D	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (IG servo error, SCA output)	vdc					
B. 33	IG servo error		0. 77		1. 05		
B. 37C	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (MG servo error, SCA input)	vac					

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EQUIPMENT TEST
DATA SHEET 3 OF 19

JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 37D	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (MG servo error, SCA output)	vdc					
B. 38	MG servo error		0. 77		1. 05		
B. 42C	Maximum right	vac					
	Maximum left	vac					
	Maximum meter spread (OG servo error, SCA input)	vac					
B. 42D	Maximum high	vdc					
	Maximum low	vdc					
	Maximum meter spread (OG servo error, SCA output)	vdc					
B. 43	OG servo error		0. 77		1. 05		
B. 59	*IG TMC (Channel 6)	v p-p					
	*IG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%		
B. 65	*MG TMC (Channel 6)	v p-p					
	*MG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%		

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EQUIPMENT TEST
DATA SHEET 4 OF 19

JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 71	*OG TMC (Channel 6)	v p-p					
	*OG TMC (Channel 8)	v p-p	Channel 6 x 2. 75 -15%		Channel 6 x 2. 75 +15%		
B. 76	*Row 1	deg					
	*Row 2	deg					
	*Row 3	deg					
B. 77	*Row 1	deg					
	*Row 2	deg					
	*Row 3	deg					
B. 78	*R&D 2. 5 vdc bias	vdc					
B. 81	*IG CDU fine error (PAVM)	vac					
	*IG CDU fine error (DVM)	vdc					
B. 82	*IG CDU fine error		0. 80		1. 20		
B. 85	*MG CDU fine error (PAVM)	vac					
	*MG CDU fine error (DVM)	vdc					
B. 86	*MG CDU fine error		0. 80		1. 20		
B. 89	*OG CDU fine error (PAVM)	vac					
	*OG CDU fine error (DVM)	vdc					

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EQUIPMENT TEST
DATA SHEET 5 OF 19

JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 90	*OG CDU fine error		0. 80		1. 20		
B. 94	*OG 1X resolver	vdc					
B. 95	*OG 1X resolver	vac					
B. 96	*OG 1X resolver		0. 90		1. 10		
B. 97	*IG 1X resolver	vac					
B. 98	*IG 1X resolver	vdc					
B. 99	*IG 1X resolver		0. 90		1. 10		
B. 100	*MG 1X resolver	vdc					
B. 101	*MG 1X resolver	vac					
B. 102	*MG 1X resolver		0. 90		1. 10		
B. 104	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 105	IG 1X resolver cos	vac					
B. 106	IG 1X resolver cos	vdc					
B. 107	IG 1X resolver cos (45°)		0. 90		1. 10		
B. 108	MG 1X resolver cos	vdc					
B. 109	MG 1X resolver cos	vac					
B. 110	MG 1X resolver cos (45°)		0. 90		1. 10		
B. 111	OG 1X resolver cos	vac					

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EQUIPMENT TEST
DATA SHEET 6 OF 19

JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 112	OG 1X resolver cos	vdc					
B. 113	OG 1X resolver cos (45°)		0.90		1.10		
B. 114	IG 1X resolver sin	vdc					
B. 115	IG 1X resolver sin	vac					
B. 116	IG 1X resolver sin (45°)		0.90		1.10		
B. 117	MG 1X resolver sin	vac					
B. 118	MG 1X resolver sin	vdc					
B. 119	MG 1X resolver sin (45°)		0.90		1.10		
B. 120	OG 1X resolver sin	vdc					
B. 121	OG 1X resolver sin	vac					
B. 122	OG 1X resolver sin (45°)		0.90		1.10		
B. 124	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 125 (B. 105)	IG 1X resolver cos	vac					
B. 125 (B. 106)	IG 1X resolver cos	vdc					
B. 126	IG 1X resolver cos (135°)		-0.90		-1.10		
B. 127 (B. 108)	MG 1X resolver cos	vdc					

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EQUIPMENT TEST
DATA SHEET 7 OF 19

JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 127 (B. 109)	MG 1X resolver cos	vac					
B. 128	MG 1X resolver cos (135°)		-0.90		-1.10		
B. 129 (B. 111)	OG 1X resolver cos	vac					
B. 129 (B. 112)	OG 1X resolver cos	vdc					
B. 130	OG 1X resolver cos (135°)		-0.90		-1.10		
B. 131 (B. 114)	IG 1X resolver sin	vdc					
B. 131 (B. 115)	IG 1X resolver sin	vac					
B. 132	IG 1X resolver sin (135°)		0.90		1.10		
B. 133 (B. 117)	MG 1X resolver sin	vac					
B. 133 (B. 118)	MG 1X resolver sin	vdc					
B. 134	MG 1X resolver sin (135°)		0.90		1.10		
B. 135 (B. 120)	OG 1X resolver sin	vdc					
B. 135 (B. 121)	OG 1X resolver sin	vac					
B. 136	OG 1X resolver sin (135°)		0.90		1.10		

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EQUIPMENT TEST
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JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 138	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 139 (B. 105)	IG 1X resolver cos	vac					
B. 139 (B. 106)	IG 1X resolver cos	vdc					
B. 140	IG 1X resolver cos (225°)		-0.90		-1.10		
B. 141 (B. 108)	MG 1X resolver cos	vdc					
B. 141 (B. 109)	MG 1X resolver cos	vac					
B. 142	MG 1X resolver cos (225°)		-0.90		-1.10		
B. 143 (B. 111)	OG 1X resolver cos	vac					
B. 143 (B. 112)	OG 1X resolver cos	vdc					
B. 144	OG 1X resolver cos (225°)		-0.90		-1.10		
B. 145 (B. 114)	IG 1X resolver sin	vdc					
B. 145 (B. 115)	IG 1X resolver sin	vac					
B. 146	IG 1X resolver sin (225°)		-0.90		-1.10		

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JDC NO. 12620
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 147 (B. 117)	MG 1X resolver sin	vac					
B. 147 (B. 118)	MG 1X resolver sin	vdc					
B. 148	MG 1X resolver sin (225°)		-0.90		-1.10		
B. 149 (B. 120)	OG 1X resolver sin	vdc					
B. 149 (B. 121)	OG 1X resolver sin	vac					
B. 150	OG 1X resolver sin (225°)		-0.90		-1.10		
B. 152	Row 1	deg					
	Row 2	deg					
	Row 3	deg					
B. 153 (B. 105)	IG 1X resolver cos	vac					
B. 153 (B. 106)	IG 1X resolver cos	vdc					
B. 154	IG 1X resolver cos (315°)		0.90		1.10		
B. 155 (B. 108)	MG 1X resolver cos	vdc					
B. 155 (B. 109)	MG 1X resolver cos	vac					
B. 156	MG 1X resolver cos (315°)		0.90		1.10		

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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 157 (B. 111)	OG 1X resolver cos	vac					
B. 157 (B. 112)	OG 1X resolver cos	vdc					
B. 158	OG 1X resolver cos (315°)		0.90		1.10		
B. 159 (B. 114)	IG 1X resolver sin	vdc					
B. 159 (B. 115)	IG 1X resolver sin	vac					
B. 160	IG 1X resolver sin (315°)		-0.90		-1.10		
B. 161 (B. 117)	MG 1X resolver sin	vac					
B. 161 (B. 118)	MG 1X resolver sin	vdc					
B. 162	MG 1X resolver sin (315°)		-0.90		-1.10		
B. 163 (B. 120)	OG 1X resolver sin	vdc					
B. 163 (B. 121)	OG 1X resolver sin	vac					
B. 164	OG 1X resolver sin (315°)		-0.90		-1.10		
B. 173	*Shaft CDU fine error	vdc	2.45		2.55		

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EQUIPMENT TEST
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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B. 174	*Shaft CDU fine error	vdc	3.75		4.25		
B. 178	*Trunnion CDU fine error	vdc	3.75		4.25		
B. 179	*Trunnion CDU fine error	vdc	2.45		2.55		
B. 186	Trunnion 1X resolver sin	vdc	4.45		4.95		
B. 187	Trunnion 1X resolver cos	vdc	4.45		4.95		
B. 190	Shaft 1X resolver sin	vdc	4.45		4.95		
B. 191	Shaft 1X resolver cos	vdc	4.45		4.95		
B. 197	Yaw attitude error	vac					
B. 198	Yaw attitude error	vdc					
B. 199	Yaw attitude error		0.90		1.10		
B. 200	Pitch attitude error	vac					
B. 201	Pitch attitude error	vdc					
B. 202	Pitch attitude error		0.90		1.10		
B. 203	Roll attitude error	vac					
B. 204	Roll attitude error	vdc					
B. 205	Roll attitude error		0.90		1.10		

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EQUIPMENT TEST
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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 33	IG Servo Error = $\frac{\text{SCA output (Step 31, Maximum Meter Spread)}}{\text{SCA input (Step 29, Maximum Meter Spread)}}$ = 0.91 (±15%)
B. 38	MG Servo Error = $\frac{\text{SCA output (Step 37, Maximum Meter Spread)}}{\text{SCA input (Step 35, Maximum Meter Spread)}}$ = 0.91 (±15%)
B. 43	OG Servo Error = $\frac{\text{SCA output (Step 42, Maximum Meter Spread)}}{\text{SCA input (Step 40, Maximum Meter Spread)}}$ = 0.91 (±15%)
B. 82	*IG CDU Fine Error = $\frac{\text{SCA output (Step 81, vdc) - 2.5V R\&D Bias (Step 78)}}{\text{2.00 x SCA input (Step 81, vac)}}$ = 1 (±20%)
B. 86	*MG CDU Fine Error = $\frac{\text{SCA output (Step 85, vdc) - 2.5V R\&D Bias (Step 78)}}{\text{2.00 x SCA input (Step 85, vac)}}$ = 1 (±20%)

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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 90	*OG CDU Fine Error = $\frac{\text{SCA output (Step 89, vdc) - 2.5V R\&D Bias (Step 78)}}{\text{2.00 x SCA input (Step 89, vac)}}$ = 1 (±20%)
B. 96	*OG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 94) - 2.5V PCM Bias (Step 22. g)]}}{\text{SCA input (Step 95)}}$ = 1 (±10%)
B. 99	*IG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 98) - 2.5V PCM Bias (Step 22. g)]}}{\text{SCA input (Step 97)}}$ = 1 (±10%)
B. 102	*MG 1X Resolver Sin (±10°) = $\frac{\text{2 x [SCA output (Step 100) - 2.5V PCM Bias (Step 22. g)]}}{\text{SCA input (Step 101)}}$ = 1 (±10%)
B. 107	IG 1X Resolver Cos (45°) = $\frac{\text{8.5 x [SCA output (Step 106) - 2.5V PCM Bias (Step 22. g)]}}{\text{SCA Input (Step 105)}}$ = 1 (±10%)

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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 110	MG 1X Resolver Cos (45°) = $\frac{8.5 \times [\text{SCA output (Step 108)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 109)}}$ = 1 (±10%)
B. 113	OG 1X Resolver Cos (45°) = $\frac{8.5 \times [\text{SCA Output (Step 112)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 111)}}$ = 1 (±10%)
B. 116	IG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 114)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 115)}}$ = 1 (±10%)
B. 119	MG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 118)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 117)}}$ = 1 (±10%)
B. 122	OG 1X Resolver Sin (45°) = $\frac{8.5 \times [\text{SCA Output (Step 120)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 121)}}$ = 1 (±10%)

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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 126	IG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 125, 106)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 125, 105)}}$ = -1 (±10%)
B. 128	MG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 127, 108)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 127, 109)}}$ = -1 (±10%)
B. 130	OG 1X Resolver Cos (135°) = $\frac{8.5 \times [\text{SCA Output (Step 129, 112)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 129, 111)}}$ = -1 (±10%)
B. 132	IG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 131, 114)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 131, 115)}}$ = 1 (±10%)
B. 134	MG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 133, 118)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 133, 117)}}$ = 1 (±10%)

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EQUIPMENT TEST
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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 136	OG 1X Resolver Sin (135°) = $\frac{8.5 \times [\text{SCA Output (Step 135, 120)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 135, 121)}}$ = 1 (±10%)
B. 140	IG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 139, 106)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 139, 105)}}$ = -1 (±10%)
B. 142	MG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 141, 108)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 141, 109)}}$ = -1 (±10%)
B. 144	OG 1X Resolver Cos (225°) = $\frac{8.5 \times [\text{SCA Output (Step 143, 112)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 143, 111)}}$ = -1 (±10%)
B. 146	IG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 145, 114)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 145, 115)}}$ = -1 (±10%)

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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 148	MG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 147, 118)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 147, 117)}}$ = -1 (±10%)
B. 150	OG 1X Resolver Sin (225°) = $\frac{8.5 \times [\text{SCA Output (Step 149, 120)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 149, 121)}}$ = -1 (±10%)
B. 154	IG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 153, 106)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 153, 105)}}$ = 1 (±10%)
B. 156	MG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 155, 108)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 155, 109)}}$ = 1 (±10%)
B. 158	OG 1X Resolver Cos (315°) = $\frac{8.5 \times [\text{SCA Output (Step 157, 112)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 157, 111)}}$ = 1 (±10%)

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JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 160	IG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 159, 114)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 159, 115)}} = -1\ (\pm 10\%)$
B. 162	MG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 161, 118)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 161, 117)}} = -1\ (\pm 10\%)$
B. 164	OG 1X Resolver Sin (315°) = $\frac{8.5 \times [\text{SCA Output (Step 163, 120)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 163, 121)}} = -1\ (\pm 10\%)$
B. 199	Yaw Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 198)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 197)}} = 1\ (\pm 10\%)$
B. 202	Pitch Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 201)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 200)}} = 1\ (\pm 10\%)$

DATE 26 JAN 67

FORM 00148
Chg. 7-21-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 19 OF 19

JDC NO. 12620 REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 205	Roll Attitude Error = $\frac{2.44 \times [\text{SCA Output (Step 204)} - 2.5\text{V PCM Bias (Step 22. g)}]}{\text{SCA Input (Step 203)}} = 1\ (\pm 10\%)$

DATE 26 JAN 67

FORM 00148
Chg. 7-23-65

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
							PS 6015000 JDC 12614
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

A. PREPARATION

1. Perform JDC 12614 to downmode to OIA PILOT POWER mode.

CAUTION: Extreme care must be exercised when mating connectors, to prevent pin and jack damage.

2. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCM to insure that pins and sockets are not bent or damaged.

3. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible, and engage four corner jackscrews until finger tight.

4. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged. When fully engaged, torque each jackscrew to 19 (±1) inch-pounds.

5. Tighten two captive screws on SCM connector to 19 (±1) inch-pounds.

6. Perform JDC 12614 to advance G and N system to standby mode.

7. Connect PSA Test Point Adapter (TPA) direct probes to TB1 jack 29 (high) and TB5 jack 22 (low).

8. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

9. Adjust G&N POWER ADJUST control on Test Control panel until digital voltmeter (DVM) indicates 28 (±0.25) vdc.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCM GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position test selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on test selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc LGC operate
102	28 vdc IMU standby

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on oscillograph signal selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output
CHANNEL 5 to 1	Y PIPA S/G output
CHANNEL 6 to 1	X PIPA S/G output
CHANNEL 8 to 4	SCM GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Zero oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

6. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on test control panel is lighted.

7. Press CHART SPEEDS 5 pushbutton on oscillograph control panel and set CHART DRIVE switch to MM/SEC.

8. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After at least 30 seconds in ISS standby mode, press PROCEED/ISS OPERATE pushbutton on Test Control panel.

DATE _____

b. Press IMU CAGE/COMMAND pushbutton.

c. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
105	Z PIPA S/G quadrature output
107	Y PIPA S/G quadrature output
108	X PIPA S/G quadrature output
117	Z PIPA S/G in-phase output
118	Y PIPA S/G in-phase output
119	X PIPA S/G in-phase output

9. Stop oscillograph. Check oscillograph record for 6 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

10. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, then repeat step A.9.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
104	2.5 vdc PCM bias
145	R&D 2.5 vdc bias
103	120 vdc reference
106	3200 cps 28 volt supply
113	800 cps 28 volt supply
135	cal mod temperature
150	IMU heater current
151	IMU blower current
201	PIPA temperature
202	IRIG temperature

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +00000 ENTR

13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error

DATE _____

Switch	Signal
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCM GDB stepper switch

14. Insure that CH 3 AC indicator is lighted.

15. Zero oscillograph channels 1, 2, and 3 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

17. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.01
FREQUENCY meter to 20.

18. Set NOR/GSE CAL switch inside Auxiliary Input Panel to NOR.

19. Perform following DSKY operations:

a. VERB 42 ENTR
B. VERB 33 ENTR

20. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

21. Press TEST START pushbutton on Test Selector panel.

22. Obtain an oscillograph trace of stabilization loop servo error data by increasing the signal generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

23. Stop oscillograph. Record peak-to-peak SCM input signals monitored on channels 1, 2, and 3, and peak-to-peak SCM output signals monitored on channel 8.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

IG, MG, AND OG TORQUE MOTOR CURRENTS

24. Insure that AMPLITUDE control on signal generator is set to 0.

25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

27. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

28. Set FREQUENCY meter on Signal Generator to 50 and RANGE switch to X1.

29. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

DATE _____

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
							PS 6015000 JDC 12614
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

A. PREPARATION

1. Perform JDC 12614 to downmode to OIA PILOT POWER mode.

CAUTION: Extreme care must be exercised when mating connectors, to prevent pin and jack damage.

2. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCM to insure that pins and sockets are not bent or damaged.

3. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible, and engage four corner jackscrews until finger tight.

4. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged. When fully engaged, torque each jackscrew to 19 (±1) inch-pounds.

5. Tighten two captive screws on SCM connector to 19 (±1) inch-pounds.

6. Perform JDC 12614 to advance G and N system to standby mode.

7. Connect PSA Test Point Adapter (TPA) direct probes to TB1 jack 29 (high) and TB5 jack 22 (low).

8. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE _____

9. Adjust G&N POWER ADJUST control on Test Control panel until digital voltmeter (DVM) indicates 28 (±0.25) vdc.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCM GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position test selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on test selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc LGC operate
102	28 vdc IMU standby

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on oscillograph signal selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output
CHANNEL 5 to 1	Y PIPA S/G output
CHANNEL 6 to 1	X PIPA S/G output
CHANNEL 8 to 4	SCM GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Zero oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

6. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on test control panel is lighted.

7. Press CHART SPEEDS 5 pushbutton on oscillograph control panel and set CHART DRIVE switch to MM/SEC.

8. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After at least 30 seconds in ISS standby mode, press PROCEED/ISS OPERATE pushbutton on Test Control panel.

DATE _____

b. Press IMU CAGE/COMMAND pushbutton.

c. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
105	Z PIPA S/G quadrature output
107	Y PIPA S/G quadrature output
108	X PIPA S/G quadrature output
117	Z PIPA S/G in-phase output
118	Y PIPA S/G in-phase output
119	X PIPA S/G in-phase output

9. Stop oscillograph. Check oscillograph record for 6 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

10. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, then repeat step A.9.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
104	2.5 vdc PCM bias
145	R&D 2.5 vdc bias
103	120 vdc reference
106	3200 cps 28 volt supply
113	800 cps 28 volt supply
135	cal mod temperature
150	IMU heater current
151	IMU blower current
201	PIPA temperature
202	IRIG temperature

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +00000 ENTR

13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Switch	Signal
CHANNEL 1 to 2	IG servo error
CHANNEL 2 to 2	MG servo error

DATE _____

Switch	Signal
CHANNEL 3 to 2	OG servo error
CHANNEL 8 to 4	SCM GDB stepper switch

14. Insure that CH 3 AC indicator is lighted.

15. Zero oscillograph channels 1, 2, and 3 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

17. Set switches on Signal Generator as follows:

FUNCTION to SINE
RANGE to X.01
FREQUENCY meter to 20.

18. Set NOR/GSE CAL switch inside Auxiliary Input Panel to NOR.

19. Perform following DSKY operations:

a. VERB 42 ENTR
B. VERB 33 ENTR

20. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

21. Press TEST START pushbutton on Test Selector panel.

22. Obtain an oscillograph trace of stabilization loop servo error data by increasing the signal generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

23. Stop oscillograph. Record peak-to-peak SCM input signals monitored on channels 1, 2, and 3, and peak-to-peak SCM output signals monitored on channel 8.

Table II

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

IG, MG, AND OG TORQUE MOTOR CURRENTS

24. Insure that AMPLITUDE control on signal generator is set to 0.

25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

27. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

28. Set FREQUENCY meter on Signal Generator to 50 and RANGE switch to X1.

29. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

DATE _____

30. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor signal generator output on oscilloscope.

31. Obtain oscillograph trace of torque motor currents by increasing signal generator AMPLITUDE control until oscilloscope indicates value listed in table III for each test. Maintain signal generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

32. Stop oscillograph. Record peak-to-peak SCM input signal monitored on channel 6 and peak-to-peak SCM output signal monitored on channel 8.

CDU FINE ERROR

33. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

NOTE: Ignore ISS warning lamp indication in steps 34 and 35.

34. Perform following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 04000 ENTR
c. 03647 ENTR
d. 42005 ENTR
e. VERB 30 ENTR
f. Observe: VERB 21 NOUN 22 Flashing (after approximately 20 seconds)
g. +00100 ENTR
h. Observe: VERB 22 NOUN 22 Flashing
i. +00100 ENTR
j. Observe: VERB 23 NOUN 22 Flashing
k. +00100 ENTR

35. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Wait 90 seconds; then record SCM input on PAVM and SCM output on DVM simultaneously for each test.

Table III

Test	Signal Generator Output	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

Table IV

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

36. Enter VERB 34 into DSKY and press ENTR pushbutton.

1X RESOLVER SIN ±10 DEGREES

37. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +01000 ENTR

38. Connect jumper between jack J4 pin F and PAVM IN jacks on Auxiliary Input Panel.

39. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

40. Connect SCM input to PAVM and SCM output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table V. For each test, perform following operations:

a. Set Test Selector panel to position listed and record DVM indication.
b. Set CROSSBAR CONTROL switches to position listed and record PAVM indication.
c. Set CROSSBAR CONTROL switches to 271.

Table V

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	143	205	MG 1X resolver sin ±10°
c	144	204	IG 1X resolver sin ±10°

1X RESOLVER SIN AND COS

41. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +04500 ENTR

42. Wait 20 seconds after performing step 41, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift, steps 43.a and 43.b must be performed as rapidly as possible for each test listed in table VI.

43. Connect SCM output and SCM input to DVM for each test listed in table VI. For each test, perform following operations:

a. Set Test Selector panel to position listed and record DVM indication.
b. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.
c. Set CROSSBAR CONTROL switches to 271.

Table VI

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +00000 ENTR

SHAFT AND TRUNNION FINE ERROR

45. Insure that Resolver Circuit Tester is connected to cable W172.

46. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to 26V.

47. Press POWER ON pushbutton on Resolver Circuit Tester Control panel.

48. Set RESOLVER ANGLE TRANSMITTER control to 0.

49. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

50. Press SHAFT SELECT/SET ENABLE pushbutton.

51. Connect shaft CDU fine error output from SCM to DVM by setting Test Selector panel to 146.

52. Perform following DSKY operations:

a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

53. Monitor SCM input on PAVM by connecting PSA TPA buffered probe to TB3 jack 33 (high) and TB3 jack 34 (low) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

54. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum signal on PAVM. Record DVM indication.

NOTE: PGNS caution lamp on Indicator Control panel will light during steps 55 through 59. Ignore lamp indication.

55. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

56. Press TRUN SELECT/SET ENABLE pushbutton.

57. Connect trunnion CDU fine error output from SCM to DVM by setting Test Selector panel to 147.

58. Remove PSA TPA buffered probe from TB3 jack 33 and connect to TB3 jack 30 (high).

59. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

60. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum signal. Record DVM indication.

61. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

62. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton.

63. Adjust RESOLVER ANGLE TRANSMITTER control until row 2 of DSKY indicates 45000.

64. Set Test Selector panel to following positions. At each position, record SCM output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin
131	Trunnion 1X resolver cos

65. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel.

66. Set Test Selector panel to following positions. At each position, record SCM output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin
130	Shaft 1X resolver cos

67. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

68. Set RESOLVER ANGLE TRANSMITTER control to 0.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

69. Perform following DSKY operations:

a. VERB 42 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing

30. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor signal generator output on oscilloscope.

31. Obtain oscillograph trace of torque motor currents by increasing signal generator AMPLITUDE control until oscilloscope indicates value listed in table III for each test. Maintain signal generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

32. Stop oscillograph. Record peak-to-peak SCM input signal monitored on channel 6 and peak-to-peak SCM output signal monitored on channel 8.

CDU FINE ERROR

33. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

NOTE: Ignore ISS warning lamp indication in steps 34 and 35.

34. Perform following DSKY operations:

a. VERB 25 NOUN 26 ENTR
b. 04000 ENTR
c. 03647 ENTR
d. 42005 ENTR
e. VERB 30 ENTR
f. Observe: VERB 21 NOUN 22 Flashing (after approximately 20 seconds)
g. +00100 ENTR
h. Observe: VERB 22 NOUN 22 Flashing
i. +00100 ENTR
j. Observe: VERB 23 NOUN 22 Flashing
k. +00100 ENTR

35. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Wait 90 seconds; then record SCM input on PAVM and SCM output on DVM simultaneously for each test.

Table III

Test	Signal Generator Output	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor current

Table IV

Test	PSA TPA Test Points High	PSA TPA Test Points Low	Test Selector Panel Position	Signal
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

36. Enter VERB 34 into DSKY and press ENTR pushbutton.

1X RESOLVER SIN ±10 DEGREES

37. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +01000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +01000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +01000 ENTR

38. Connect jumper between jack J4 pin F and PAVM IN jacks on Auxiliary Input Panel.

39. Perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

40. Connect SCM input to PAVM and SCM output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table V. For each test, perform following operations:

a. Set Test Selector panel to position listed and record DVM indication.
b. Set CROSSBAR CONTROL switches to position listed and record PAVM indication.
c. Set CROSSBAR CONTROL switches to 271.

Table V

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	143	205	MG 1X resolver sin ±10°
c	144	204	IG 1X resolver sin ±10°

1X RESOLVER SIN AND COS

41. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +04500 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +04500 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +04500 ENTR

42. Wait 20 seconds after performing step 41, then perform following DSKY operations:

a. VERB 42 ENTR
b. VERB 33 ENTR

NOTE: Due to IMU drift, steps 43.a and 43.b must be performed as rapidly as possible for each test listed in table VI.

43. Connect SCM output and SCM input to DVM for each test listed in table VI. For each test, perform following operations:

a. Set Test Selector panel to position listed and record DVM indication.
b. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.
c. Set CROSSBAR CONTROL switches to 271.

Table VI

Test	Test Selector Panel Position	CROSSBAR CONTROL Position	Signal
a	120	243	IG 1X resolver cos
b	121	242	MG 1X resolver cos
c	122	241	OG 1X resolver cos
d	123	144	IG 1X resolver sin
e	124	143	MG 1X resolver sin
f	125	142	OG 1X resolver sin

44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing
e. +00000 ENTR
f. Observe: VERB 23 NOUN 22 Flashing
g. +00000 ENTR

SHAFT AND TRUNNION FINE ERROR

45. Insure that Resolver Circuit Tester is connected to cable W172.

46. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to 26V.

47. Press POWER ON pushbutton on Resolver Circuit Tester Control panel.

48. Set RESOLVER ANGLE TRANSMITTER control to 0.

49. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

50. Press SHAFT SELECT/SET ENABLE pushbutton.

51. Connect shaft CDU fine error output from SCM to DVM by setting Test Selector panel to 146.

52. Perform following DSKY operations:

a. VERB 40 NOUN 40 ENTR
b. VERB 21 NOUN 10 ENTR
c. 00012 ENTR
d. 00011 ENTR

53. Monitor SCM input on PAVM by connecting PSA TPA buffered probe to TB3 jack 33 (high) and TB3 jack 34 (low) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

54. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum signal on PAVM. Record DVM indication.

NOTE: PGNS caution lamp on Indicator Control panel will light during steps 55 through 59. Ignore lamp indication.

55. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

56. Press TRUN SELECT/SET ENABLE pushbutton.

57. Connect trunnion CDU fine error output from SCM to DVM by setting Test Selector panel to 147.

58. Remove PSA TPA buffered probe from TB3 jack 33 and connect to TB3 jack 30 (high).

59. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

60. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum signal. Record DVM indication.

61. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR
b. 00012 ENTR
c. 00010 ENTR

SHAFT AND TRUNNION 1X RESOLVER SIN AND COS

62. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton.

63. Adjust RESOLVER ANGLE TRANSMITTER control until row 2 of DSKY indicates 45000.

64. Set Test Selector panel to following positions. At each position, record SCM output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunnion 1X resolver sin
131	Trunnion 1X resolver cos

65. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel.

66. Set Test Selector panel to following positions. At each position, record SCM output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin
130	Shaft 1X resolver cos

67. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

68. Set RESOLVER ANGLE TRANSMITTER control to 0.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

69. Perform following DSKY operations:

a. VERB 42 NOUN 20 ENTR
b. Observe: VERB 21 NOUN 22 Flashing
c. +00000 ENTR
d. Observe: VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

70. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 71. Ignore lamp indication.

71. Perform following DSKY operations:

a. VERB 43 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +01600 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +01600 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +01600 ENTR

72. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel.

73. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA direct probe to test points listed in table VII and setting Test Selector panel to positions indicated. Record SCM input on PAVM and SCM output on DVM for each test.

Table VII

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-44	TB4-48	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-43	TB4-47	116	Roll attitude error

74. Perform JDC 12614 to turn off G and N system.

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =

$$\frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}}$$

= 1 (±10%)

b. MG CDU fine error =

$$\frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}}$$

= 1 (±10%)

c. OG CDU fine error =

$$\frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}}$$

= 1 (±10%)

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° =

$$\frac{2\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

b. MG 1X resolver sin ±10° =

$$\frac{2\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

c. IG 1X resolver sin ±10° =

$$\frac{2\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =

$$\frac{8.1\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

b. MG 1X resolver cos =

$$\frac{8.1\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

c. OG 1X resolver cos =

$$\frac{8.1\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

d. IG 1X resolver sin =

$$\frac{8.1\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

e. MG 1X resolver sin =

$$\frac{8.1\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

f. OG 1X resolver sin =

$$\frac{8.1\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}}$$

= 1 (±10%)

4. Perform following attitude error calculations:

a. Yaw attitude error =

$$\frac{2.44\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

b. Pitch attitude error =

$$\frac{2.44\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

c. Roll attitude error =

$$\frac{2.44\,(\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}}$$

= 1 (±10%)

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12620 REV. - INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ____ START ____ END ____ SITE / LOCATION
SER. NO. ____ DWG ____ REV. ____	TIME ____ START ____ END ____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE ____

NAME _____ SER. NO. ____ CAL DATE ____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc LGC operate	vdc	4.0		4.6		
	28 vdc IMU standby	vdc	4.0		4.6		
B.9	Loop closure test 1						
	Loop closure test 2						
	Loop closure test 3						
	Loop closure test 4						
	Loop closure test 5						
	Loop closure test 6						
B.11	2.5 vdc PCM bias	vdc	2.47		2.53		
	R&D 2.5 vdc bias	vdc	2.47		2.53		
	120 vdc reference	vdc	2.80		4.20		
	3200 cps 28 volt supply	vdc	4.20		4.80		
	800 cps 28 volt supply	vdc	4.20		4.80		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (cont)	Cal module temperature	vdc	0.40		1.26		
	IMU heater current (if heater is off)	vdc	4.0		4.6		
	IMU blower current (if blower is on)	vdc	4.0		4.6		
	PIPA temperature	vdc	2.0		3.0		
	IRIG temperature	vdc	2.37		3.70		
B.23.a	IG servo error channel 1	v p-p					
	IG servo error channel 8	v p-p	channel 1 x 6/5 - 15%		channel 1 x 6/5 + 15%		
B.23.b	MG servo error channel 2	v p-p					
	MG servo error channel 8	v p-p	channel 2 x 6/5 - 15%		channel 2 x 6/5 + 15%		
B.23.c	OG servo error channel 3	v p-p					
	OG servo error channel 8	v p-p	channel 3 x 6/5 - 15%		channel 3 x 6/5 + 15%		

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e. +00000 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +00000 ENTR

70. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00060 ENTR

NOTE: ISS warning lamp on Indicator Control panel may light during step 71. Ignore lamp indication.

71. Perform following DSKY operations:

a. VERB 43 ENTR

b. Observe:
VERB 21 NOUN 22 Flashing

c. +01600 ENTR

d. Observe:
VERB 22 NOUN 22 Flashing

e. +01600 ENTR

f. Observe:
VERB 23 NOUN 22 Flashing

g. +01600 ENTR

72. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel.

73. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA direct probe to test points listed in table VII and setting Test Selector panel to positions indicated. Record SCM input on PAVM and SCM output on DVM for each test.

Table VII

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-44	TB4-48	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-43	TB4-47	116	Roll attitude error

74. Perform JDC 12614 to turn off G and N system.

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =

$$\frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

b. MG CDU fine error =

$$\frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

c. OG CDU fine error =

$$\frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° =

$$\frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

DATE _____

b. MG 1X resolver sin ±10° =

$$\frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

c. IG 1X resolver sin ±10° =

$$\frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

b. MG 1X resolver cos =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

c. OG 1X resolver cos =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

d. IG 1X resolver sin =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

e. MG 1X resolver sin =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

f. OG 1X resolver sin =

$$\frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

4. Perform following attitude error calculations:

a. Yaw attitude error =

$$\frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

b. Pitch attitude error =

$$\frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

c. Roll attitude error =

$$\frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12620 REV. - INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST
TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY
DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc LGC operate	vdc	4.0		4.6		
	28 vdc IMU standby	vdc	4.0		4.6		
B.9	Loop closure test 1						
	Loop closure test 2						
	Loop closure test 3						
	Loop closure test 4						
	Loop closure test 5						
	Loop closure test 6						
B.11	2.5 vdc PCM bias	vdc	2.47		2.53		
	R&D 2.5 vdc bias	vdc	2.47		2.53		
	120 vdc reference	vdc	2.80		4.20		
	3200 cps 28 volt supply	vdc	4.20		4.80		
	800 cps 28 volt supply	vdc	4.20		4.80		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (cont)	Cal module temperature	vdc	0.40		1.26		
	IMU heater current (if heater is off)	vdc	4.0		4.6		
	IMU blower current (if blower is on)	vdc	4.0		4.6		
	PIPA temperature	vdc	2.0		3.0		
	IRIG temperature	vdc	2.37		3.70		
B.23.a	IG servo error channel 1	v p-p					
	IG servo error channel 8	v p-p	channel 1 x 6/5 - 15%		channel 1 x 6/5 + 15%		
B.23.b	MG servo error channel 2	v p-p					
	MG servo error channel 8	v p-p	channel 2 x 6/5 - 15%		channel 2 x 6/5 + 15%		
B.23.c	OG servo error channel 3	v p-p					
	OG servo error channel 8	v p-p	channel 3 x 6/5 - 15%		channel 3 x 6/5 + 15%		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC NO. 12620
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.32.a	IG torque motor current channel 6	mm p-p					
	IG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.32.b	MG torque motor current channel 6	mm p-p					
	MG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.32.c	OG torque motor current channel 6	mm p-p					
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.35.a	IG CDU fine error (PAVM)	vac					
	IG CDU fine error (DVM)	vdc					
B.35.b	MG CDU fine error (PAVM)	vac					
	MG CDU fine error (DVM)	vdc					
B.35.c	OG CDU fine error (PAVM)	vac					
	OG CDU fine error (DVM)	vdc					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC NO. 12620
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.40.a	OG 1X resolver sin ±10° (PAVM)	vac					
	OG 1X resolver sin ±10° (DVM)	vdc					
B.40.b	MG 1X resolver sin ±10° (PAVM)	vac					
	MG 1X resolver sin ±10° (DVM)	vdc					
B.40.c	IG 1X resolver sin ±10° (PAVM)	vac					
	IG 1X resolver sin ±10° (DVM)	vdc					
B.43.a	IG 1X resolver cos (Test a)	vdc					
B.43.b	IG 1X resolver cos (Test a)	vac					
B.43.a	MG 1X resolver cos (Test b)	vdc					
B.43.b	MG 1X resolver cos (Test b)	vac					
B.43.a	OG 1X resolver cos (Test c)	vdc					
B.43.b	OG 1X resolver cos (Test c)	vac					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC NO. 12620
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.43.a	IG 1X resolver sin (Test d)	vdc					
B.43.b	IG 1X resolver sin (Test d)	vac					
B.43.a	MG 1X resolver sin (Test e)	vdc					
B.43.b	MG 1X resolver sin (Test e)	vac					
B.43.a	OG 1X resolver sin (Test f)	vdc					
B.43.b	OG 1X resolver sin (Test f)	vac					
B.54	Shaft CDU fine error	vdc	2.45		2.55		
B.55	Shaft CDU fine error	vdc	3.75		4.25		
B.59	Trunnion CDU fine error	vdc	3.75		4.25		
B.60	Trunnion CDU fine error	vdc	2.45		2.55		
B.64	Trunnion 1X resolver sin	vdc	4.45		4.95		
	Trunnion 1X resolver cos	vdc	4.45		4.95		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC NO. 12620
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.66	Shaft 1X resolver sin	vdc	4.45		4.95		
	Shaft 1X resolver cos	vdc	4.45		4.95		
B.73.a	Yaw attitude error (PAVM)	vac					
	Yaw attitude error (DVM)	vdc					
B.73.b	Pitch attitude error (PAVM)	vac					
	Pitch attitude error (DVM)	vdc					
B.73.c	Roll attitude error (PAVM)	vac					
	Roll attitude error (DVM)	vdc					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.32.a	IG torque motor current channel 6	mm p-p					
	IG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.32.b	MG torque motor current channel 6	mm p-p					
	MG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.32.c	OG torque motor current channel 6	mm p-p					
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%		
B.35.a	IG CDU fine error (PAVM)	vac					
	IG CDU fine error (DVM)	vdc					
B.35.b	MG CDU fine error (PAVM)	vac					
	MG CDU fine error (DVM)	vdc					
B.35.c	OG CDU fine error (PAVM)	vac					
	OG CDU fine error (DVM)	vdc					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.40.a	OG 1X resolver sin ±10° (PAVM)	vac					
	OG 1X resolver sin ±10° (DVM)	vdc					
B.40.b	MG 1X resolver sin ±10° (PAVM)	vac					
	MG 1X resolver sin ±10° (DVM)	vdc					
B.40.c	IG 1X resolver sin ±10° (PAVM)	vac					
	IG 1X resolver sin ±10° (DVM)	vdc					
B.43.a	IG 1X resolver cos (Test a)	vdc					
B.43.b	IG 1X resolver cos (Test a)	vac					
B.43.a	MG 1X resolver cos (Test b)	vdc					
B.43.b	MG 1X resolver cos (Test b)	vac					
B.43.a	OG 1X resolver cos (Test c)	vdc					
B.43.b	OG 1X resolver cos (Test c)	vac					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.43.a	IG 1X resolver sin (Test d)	vdc					
B.43.b	IG 1X resolver sin (Test d)	vac					
B.43.a	MG 1X resolver sin (Test e)	vdc					
B.43.b	MG 1X resolver sin (Test e)	vac					
B.43.a	OG 1X resolver sin (Test f)	vdc					
B.43.b	OG 1X resolver sin (Test f)	vac					
B.54	Shaft CDU fine error	vdc	2.45		2.55		
B.55	Shaft CDU fine error	vdc	3.75		4.25		
B.59	Trunnion CDU fine error	vdc	3.75		4.25		
B.60	Trunnion CDU fine error	vdc	2.45		2.55		
B.64	Trunnion 1X resolver sin	vdc	4.45		4.95		
	Trunnion 1X resolver cos	vdc	4.45		4.95		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.66	Shaft 1X resolver sin	vdc	4.45		4.95		
	Shaft 1X resolver cos	vdc	4.45		4.95		
B.73.a	Yaw attitude error (PAVM)	vac					
	Yaw attitude error (DVM)	vdc					
B.73.b	Pitch attitude error (PAVM)	vac					
	Pitch attitude error (DVM)	vdc					
B.73.c	Roll attitude error (PAVM)	vac					
	Roll attitude error (DVM)	vdc					

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

$$\text{IG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{MG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{OG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{OG 1X resolver sin} \pm 10^{\circ} = \frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{MG 1X resolver sin} \pm 10^{\circ} = \frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

$$\text{IG 1X resolver sin} \pm 10^{\circ} = \frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{IG 1X resolver cos} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{MG 1X resolver cos} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{OG 1X resolver cos} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{IG 1X resolver sin} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC NO. 12620 REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

$$\text{MG 1X resolver sin} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{OG 1X resolver sin} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{Yaw attitude error} = \frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{Pitch attitude error} = \frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{Roll attitude error} = \frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC NO. 12620 REV -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

$$\text{IG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{MG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{OG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{OG 1X resolver sin} \pm 10^{\circ} = \frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{MG 1X resolver sin} \pm 10^{\circ} = \frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC NO. 12620 REV -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

$$\text{IG 1X resolver sin} \pm 10^{\circ} = \frac{2\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{IG 1X resolver cos} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{MG 1X resolver cos} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{OG 1X resolver cos} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{IG 1X resolver sin} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC NO. 12620 REV -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS

$$\text{MG 1X resolver sin} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{OG 1X resolver sin} = \frac{8.1\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1\ (\pm 10\%)$$

$$\text{Yaw attitude error} = \frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{Pitch attitude error} = \frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

$$\text{Roll attitude error} = \frac{2.44\ (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1\ (\pm 10\%)$$

DATE _____

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
A	8-10-66	30551	All	All	EA	-	
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:

a. DE MARGINS to NORM
b. CHV METERS to DCVM
c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00011 ENTR
c. Observe
Row 1 indicates 00005
d. Observe
Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

VERIFICATION WITH SIDL REQUIRED BEFORE USE

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS CMD lamps on the Monitor panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

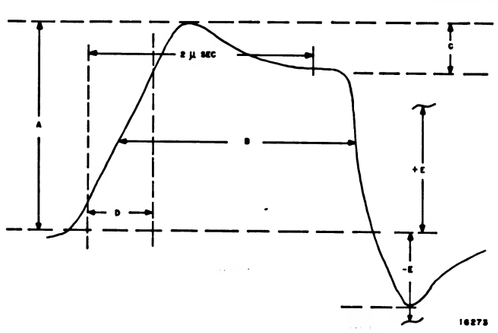
16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make the following switch settings on the XY Interface panel.

a. SCOPE switch to T
b. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
c. LOAD CHAN T 200 OHMS - press to light
d. Connect the following COAX Jumpers between the scope outputs (XY Panel) and the CTS Oscilloscope.
1. Scope A output (XY Panel) to Channel A input.
2. Scope B output (XY Panel) to Channel B input on the scope. Set the Mode Function Switch on the scope to Channel A.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure 1. Waveform Description

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope

indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to S. Set the SWEEP SELECT switch on the oscilloscope to A+B. Leave the preceding switches in these positions for the duration of the RADAR test. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T→S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4
b. TRIGGER LEVEL control to mid range
c. TIME selector to MS
d. DISPLAY to 00
e. GATE switch to AUTO
f. FUNCTION switch to A→B
g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Set C33-4, C33-5, C33-8 on RDC Panel.
f. Press CHANNEL S 510 OHM button and CHANNEL T 510 OHM button.

LR RANGE GATE STROBE TEST

31. Press VERB 57 ENTR, 00014 ENTR, VERB 33 ENTR. Adjust the oscilloscope and

TDRR _____

JOB LGC OUTPUT TEST

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INITIAL TDRR 27134 D.S. PGS 7

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and ECS command interface, and the pulse train outputs of the Main Engine commanded, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL ~~MIT~~	APPROVAL NASA	REFERENCES
A	8/12/66	30557	ALL	ALL	[illegible]		
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:

a. DE MARGINS to NOMI

b. CHV METERS to DCVM

c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00011 ENTR

c. Observe
Row 1 indicates 00005

d. Observe
Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE _____

TDRR _____

JOB LGC OUTPUT TEST

JDC 12621 REV A PAGE 2 OF

SUBSYSTEM LEM G & N SYSTEM

ASSY

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS CMD lamps on the Monitor panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make the following switch settings on the XY Interface panel:

a. SCOPE switch to T

b. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)

DATE _____

JOB LGC OUTPUT TEST

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SUBSYSTEM LEM G & N SYSTEM

ASSY

c. LOAD CHAN T 200 OHMS - press to light.

d. Connect the following COAX Jumpers between the scope outputs (XY Panel) and the CTS Oscilloscope.

1. Scope A. output (XY Panel) to Channel A input.

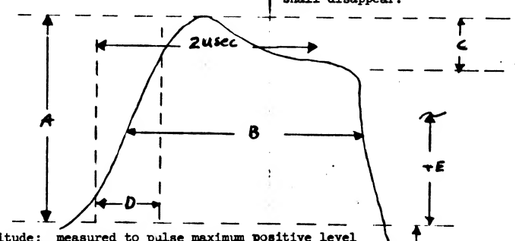
2. Scope B output (XY Panel) to Channel B input on the scope. Set the Mode Function Switch on the scope to Channel A.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: Measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to Signal maximum negative level
F - Noise: (No Pulse)

Figure 1. Waveform Description

DATE _____

JOB LGC OUTPUT TEST

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SUBSYSTEM LEM G & N SYSTEM

ASSY

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to S. Set the SWEEP SELECT switch on the oscilloscope to A+B. Leave the preceeding switches in these positions for the duration of the RADAR test. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T-S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4

b. TRIGGER LEVEL control to mid range

c. TIME selector to MS

d. DISPLAY to 00

e. GATE switch to AUTO

f. FUNCTION switch to A-B

g. SLOPE to (+)

DATE _____

measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE GATE STROBE TIMING TEST

32. Set the CHANNEL S switches to 118 (LR RESET STROBE).

33. Connect a coax to SCOPE B jack and B input jack on the oscilloscope. Set XY Interface Scope SW to S+T and Scope Mode to ALT. switch.

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set XY Interface Scope switch to S and scope mode to A+B. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of
LR Range
data 03437 ENTR
c. Observe
Row 1 indicates 00011
d. Observe
Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR Z_A GATE STROBE).

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set XY INTERFACE switch to S+T and scope mode switch to ALT.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_Z DATA ACQUISITION TEST

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of
V_Z data
03437 ENTR
c. Observe
Row 1 indicates 00001
d. Observe
Row 2 indicates 10437

LR V_Y READ CYCLE TIMING TEST

43. Reset the Frequency Counter. Set the CHANNEL T switches to 218 (LR V_Y GATE STROBE) and CHANNEL S switches to 314.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118.

46. Determine and record the timing lag of a LR Y_A Gate Strobe pulse (T-118) at their respective A/2 points.

LR V_Y GATE STROBE TEST

47. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_Y DATA ACQUISITION TEST

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of
V_Y
c. Observe
Row 1 indicates 00001
d. Observe
Row 2 indicates 10437

LR V_X READ CYCLE TIMING TEST

49. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR V_X GATE STROBE) and CHANNEL S switches to 314.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-116) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_X DATA ACQUISITION TEST

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of
X_A
c. Observe
Row 1 indicated 00001
d. Observe
Row 2 indicates 10437

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of
RR Range
data 03437 ENTR
c. Observe
Row 1 indicates 77777
d. Observe
Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT).

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

RR SYNC FOR READOUT STROBE TEST

63. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE GATE STROBE TIMING TEST

64. Set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of
RR Range
data 03437 ENTR
c. Observe
Row 1 indicates 00017
d. Observe
Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR	
b. 01750		ENTR	
c. 11753		ENTR	
d.	NOUN 15	ENTR	
e. 01755		ENTR	ENTR
f. 04353		ENTR	ENTR
g. 00100		ENTR	ENTR
h. 77777		ENTR	ENTR
i. 55753		ENTR	ENTR
j. 31754		ENTR	ENTR
k. 55000		ENTR	ENTR
l. 25757		ENTR	ENTR
m. 01750		ENTR	
n.	NOUN 01	ENTR	
o. 00411		ENTR	
p. 01000		ENTR	
q. VERB 25	NOUN 26	ENTR	
r. 04000		ENTR	
s. 01750		ENTR	
t. 00003		ENTR	

u. VERB 30		ENTR
v. VERB 01	NOUN 01	ENTR
w. 01000		ENTR
x. Observe		
Row 1 indicates 77777		
y.	NOUN 01	ENTR
z. 01077		ENTR
aa. Observe		
Row 1 indicates 77777		

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press
b. WORD RATE 50 PPS pushbutton - press to light
c. Set scope mode switch to B. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T.
d. SCOPE switch to S+T

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the SCOPE switch to S+T and the CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Adjust the oscilloscope and repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe
Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

NOTE: Disregard the PROG and TRACKER alarms during the following test.

30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12

b. STANDARD RATE pushbutton - press to light

c. POSITIVE pushbutton - press to light

d. OUT IN pushbutton - press to light

e. Set C33-4, C33-5, C33-8 on RDC Panel.

f. Press CHANNEL S 510 OHM button and CHANNEL T 510 OHM button.

LR RANGE GATE STROBE TEST

31. Press VERB 57 ENTR, 00014 ENTR, VERB 33 ENTR. Adjust the oscilloscope and measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE GATE STROBE TIMING TEST

32. Set the CHANNEL S switches to 118 (LR RESET STROBE).

33. Connect a coax to SCOPE B jack and B input jack on the oscilloscope. Set XY Interface Scope SW to S-T and Scope Mode to ALT. switch.

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set XY Interface Scope switch to S and scope mode to A+B. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR

b. Address of LR Range data 03437 ENTR

c. Observe Row 1 indicates 00011

d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

DATE _____

37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR Z_A GATE STROBE).

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set XY INTERFACE switch to S-T and scope mode switch to ALT.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_Z DATA ACQUISITION TEST

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR

b. Address of V_Z data 03437 ENTR

c. Observe Row 1 indicates 00001

d. Observe Row 2 indicates 10437

LR V_Y READ CYCLE TIMING TEST

43. Reset the Frequency Counter. Set the CHANNEL T switches to 218 (LR V_Y GATE STROBE) and CHANNEL S switches to 314.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118.

46. Determine and record the timing lag of a LR Y_A Gate Strobe pulse (T-118) at their respective A/2 points.

LR V_Y GATE STROBE TEST

47. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_Y DATA ACQUISITION TEST

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR

b. Address of V_Y

c. Observe Row 1 indicates 00001

DATE _____

d. Observe Row 2 indicates 10437

LR V_X READ CYCLE TIMING TEST

49. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR V_X GATE STROBE) and CHANNEL S switches to 314.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-116) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_X DATA ACQUISITION TEST

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR

b. Address of X_A

c. Observe Row 1 indicated 00001

d. Observe Row 2 indicates 10437

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR

b. Address of RR Range data 03437 ENTR

c. Observe Row 1 indicates 77777

DATE _____

d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT).

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

RR SYNC FOR READOUT STROBE TEST

63. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE GATE STROBE TIMING TEST

64. Set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR

b. Address of RR. Range data 03437 ENTR

c. Observe Row 1 indicates 00017

d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01750		ENTR
c.	11753		ENTR
d.		NOUN 15	ENTR
e.	01755		ENTR ENTR
f.	04353		ENTR ENTR
g.	00100		ENTR ENTR
h.	77777		ENTR ENTR
i.	55753		ENTR ENTR
j.	31754		ENTR ENTR
k.	55000		ENTR ENTR
l.	25757		ENTR ENTR
m.	01750		ENTR

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 6

JDC NO. 12621
REV. A
INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE _____
SER. NO. _____ DWG _____ REV. _____

TEST HISTORY

DATE _____ START _____ END _____ SITE / LOCATION
TIME _____ START _____ END _____ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. _____ CAL DATE
NAME _____ SER. NO. _____ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	REC Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.u	RCS Jet +23F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 6

JDC NO. 12621
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1s	vdc	2.0		5.0		
9	RCS Jet +Z3F	vdc	9.0		11.0		
	RCS Jet -Z4F	vdc	9.0		11.0		
	RCS Jet -Z1F	vdc	9.0		11.0		
	RCS Jet +Z2F	vdc	9.0		11.0		
	RCS Jet +Y2s	vdc	9.0		11.0		
	RCS Jet -Y3S	vdc	9.0		11.0		
	RCS Jet -Y4S	vdc	9.0		11.0		
	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 6

JDC NO. 12621
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec	2.0		4.0		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			2.0		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 6

JDC NO. 12621
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.A	Amplitude	volts	4.0		10.0		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A.5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	u sec	80.935				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		
53.A	Amplitude	volts	4.0		10.0		

DATE 15 MAR 66

n. NOUN 01 ENTR

o. 00411 ENTR

p. 01000 ENTR

q. VERB 25 NOUN 26 ENTR

r. 04000 ENTR

s. 01750 ENTR

t. 00003 ENTR

u. VERB 30 ENTR

v. VERB 01 NOUN 01 ENTR

w. 01000 ENTR

x. Observe
Row 1 indicates 77777

y. NOUN 01 ENTR

z. 01077 ENTR

aa. Observe
Row 1 indicates 77777

If Row 1 does not indicate 7777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press

b. WORD RATE 50 PPS pushbutton - press to light

c. Set scope mode switch to B. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T.

d. SCOPE switch to S-T

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the SCOPE switch to S-T and the CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the dealy of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Adjust the oscilloscope and repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00033 ENTR

DATE _____

c. Observe

Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF ___

JDC NO. 12621 REV. A INITIAL TDRR 07134

JOB _____

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE ___ START ___ END ___ SITE / LOCATION
SER. NO. ___ DWG ___ REV. ___	TIME ___ START ___ END ___ TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ___ CAL DATE

NAME _____ SER. NO. ___ CAL DATE

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	REC Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF ___

JDC NO. 12621 REV. A

JOB _____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.a	RCS Jet +23F	vdc	2.0		5.0		
7.b	RCS Jet -24F	vdc	2.0		5.0		
7.c	RCS Jet -21F	vdc	2.0		5.0		
7.d	RCS Jet +22F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1S	vdc	2.0		5.0		
9	RCS Jet +23F	vdc	9.0		11.0		
	RCS Jet -24F	vdc	9.0		11.0		
	RCS Jet -21F	vdc	9.0		11.0		
	RCS Jet +22F	vdc	9.0		11.0		
	RCS Jet +Y2S	vdc	9.0		11.0		
	RCS Jet -Y3S	vdc	9.0		11.0		
	RCS Jet -Y4S	vdc	9.0		11.0		
	RCS Jet -Y1S	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 6

JDC NO. 12621
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Read Cycle Timing	u sec	80.935				
58	RR Range Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	4.0		10.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	u sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			0.2		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

DATE 15 MAR 66

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 6

JDC NO. 12621
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			2.0		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73	Telemetry DLNK Data						
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.D	Droop	volts			A/5		
73.E	Rise Time	u sec			0.2		

DATE 15 MAR 66

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 3 OF ___

JDC NO. 12621
REV. A

JOB _____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch GimbalTrim	vdc	2.0		5.0		
13.b	-Pitch GimbalTrim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch GimbalTrim	vdc	9.0		11.0		
	-Pitch GimbalTrim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 4 OF ___

JDC NO. 12621
REV. A

JOB _____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec	2.0		4.0		
22.A.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			2.0		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		

DATE _____

APOLLO G & N
EQUIPMENT TEST
DATA SHEET 5 OF ___

JDC NO. 12621
REV. A

JOB _____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.A	Amplitude	volts	4.0		10.0		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A.5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	u sec	80.935				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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EQUIPMENT TEST
DATA SHEET 6 OF ___

JDC NO. 12621
REV. A

JOB _____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Read Cycle Timing	u sec	80.935				
58	RR Range Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	4.0		10.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	u sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			0.2		

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APOLLO G & N
EQUIPMENT TEST
DATA SHEET 7 OF ___

JDC NO. 12621
REV. A

JOB _____

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			2.0		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73	Telemetry DLNK Data						
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.D	Droop	volts			A/5		
73.E	Rise Time	u sec			0.2		

DATE _____

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
(M) A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
   a. DE MARGINS to NORM
   b. CHV METERS to DCVM
   c. CHANNEL V selector to 601
3. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
   c. Observe Row 1 indicates 00005
   d. Observe Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
6. Repeat step 4.
7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.
9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.
11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.
12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS CMD lamps on the Monitor panel are lighted.
15. Press the ENTR pushbutton on the DSKY.
16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make the following switch settings on the XY Interface panel.
   a. SCOPE switch to T→V
   b. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
   c. LOAD CHAN T 200 OHMS - press to light
   d. Connect the following COAX Jumpers between the scope outputs (XY Panel) and the CTS Oscilloscope.
      1. Scope A output (XY Panel) to Channel A input. "Connect the Scope A output from the XY Panel to the EXT TRIG input jack on the oscilloscope and set the Source switch on the oscilloscope to EXT."

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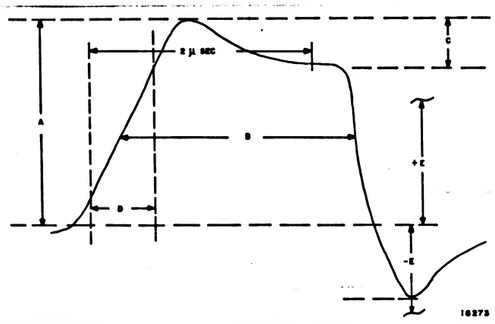
   2. Scope B output (XY Panel) to Channel B input on the scope. Set the Mode Function Switch on the scope to Channel A.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)
19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)
21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure 1. Waveform Description

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23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.
24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)
25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to S→T. Set the oscilloscope MODE switch to ALT. Leave the preceding switches in these positions for the duration of the RADAR test. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).
28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T→S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
29. Set the Frequency Counter Panel controls as follows:
   a. INPUT VOLTS RMS selector to 6.4
   b. TRIGGER LEVEL control to mid range
   c. TIME selector to MS
   d. DISPLAY fully CCW but not into detent position
   e. GATE switch to AUTO
   f. FUNCTION switch to A→B
   g. SLOPE to (+)
      NOTE: Disregard the PROG and TRACKER alarms during the following test.
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:
   a. Selector to 12
   b. STANDARD RATE pushbutton - press to light
   c. POSITIVE pushbutton - press to light
   d. OUT IN pushbutton - press to light
   e. Set C33-4, C33-5, C33-8 on RDC Panel.

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31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set the SCOPE switch on the XY Interface Panel to the T→V position. Set the oscilloscope MODE switch to A. Measure and record the indication of A through F. (See Figure 1.) After completing measurements, return the SCOPE switch on the XY Interface Panel to the S→T position and the oscilloscope MODE switch to ALT.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR Z_A GATE STROBE).

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequnecy Counter indications.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

NOTE: The pulse to be measured in step 41 will be found on the B trace.

41. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_Z DATA ACQUISITION TEST

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437

LR V_Y READ CYCLE TIMING TEST

43. Reset the Frequency Counter. Set the CHANNEL T switches to 218 (LR V_Y GATE STROBE) and CHANNEL S switches to 314.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118.

46. Determine and record the timing lag of a LR Y_A Gate Strobe pulse (T-218) at their respective A/2 points.

LR V_Y STROBE TEST

NOTE: The pulse to be measured in step 47 will be found on the B trace.

47. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_Y DATA ACQUISITION TEST

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437

LR V_X READ CYCLE TIMING TEST

49. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR V_X GATE STROBE) and CHANNEL S switches to 314.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

NOTE: The pulse to be measured in step 53 will be found on the B trace.

53. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR V_X DATA ACQUISITION TEST

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of X_A data 03437 ENTR
c. Observe Row 1 indicated 00001
d. Observe Row 2 indicates 10437

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

NOTE: The pulse to be measured in step 59 will be found on the B trace.

59. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT).

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

RR SYNC FOR READOUT STROBE TEST

63. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE GATE STROBE TIMING TEST

64. Set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

NOTE: The pulse to be measured in step 66 will be found on the B trace.

66. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01750 ENTR
c. 11753 ENTR
d. NOUN 15 ENTR
e. 01755 ENTR ENTR
f. 04353 ENTR ENTR
g. 00100 ENTR ENTR
h. 77777 ENTR ENTR
i. 55753 ENTR ENTR
j. 31754 ENTR ENTR
k. 55000 ENTR ENTR
l. 25757 ENTR ENTR
m. 01750 ENTR
n. NOUN 01 ENTR
o. 00411 ENTR
p. 01000 ENTR
q. VERB 25 NOUN 26 ENTR
r. 04000 ENTR
s. 01750 ENTR
t. 00003 ENTR
u. VERB 30 ENTR
v. VERB 01 NOUN 01 ENTR
w. 01000 ENTR
x. Observe Row 1 indicates 77777
y. NOUN 01 ENTR
z. 01077 ENTR
aa. Observe Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press
b. WORD RATE 50 PPS pushbutton - press to light
c. Set scope mode switch to B. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T.
d. SCOPE switch to S→T

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Adjust the oscilloscope and repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Preform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe
Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12621 REV. B INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	REC Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.u	RCS Jet +23F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1s	vdc	2.0		5.0		
9	RCS Jet +Z3F	vdc	9.0		11.0		
	RCS Jet -Z4F	vdc	9.0		11.0		
	RCS Jet -Z1F	vdc	9.0		11.0		
	RCS Jet +Z2F	vdc	9.0		11.0		
	RCS Jet +Y2s	vdc	9.0		11.0		
	RCS Jet -Y3S	vdc	9.0		11.0		
	RCS Jet -Y4S	vdc	9.0		11.0		
	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC NO. 12621 REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec	2.0		4.0		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			2.0		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

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EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC NO. 12621 REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.0		4.0		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.0		4.0		

DATE

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EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC NO. 12621 REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.0		4.0		
41.C	Dropo	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A.5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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EQUIPMENT TEST
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TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12621 REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	4.0		10.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			0.2		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC NO. 12621 REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			2.0		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73	Telemetry DLNK Data						
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.D	Droop	volts			A/5		
73.E	Rise Time	u sec			0.2		

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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3.6	EA	-

REFERENCES

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

1. Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
   a. DE MARGINS to NORM
   b. CHV METERS to DCVM
   c. CHANNEL V selector to 601
3. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
   c. Observe Row 1 indicates 00005
   d. Observe Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
6. Repeat step 4.
7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.
9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.
11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.
12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS CMD lamps on the Monitor panel are lighted.
15. Press the ENTR pushbutton on the DSKY.
16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make the following switch settings on the XY Interface panel.
   a. SCOPE switch to T DIFF.
   b. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
   c. LOAD CHAN T 200 OHMS - press to light
   d. Connect the following COAX Jumpers between the scope outputs (XY Panel) and the CTS Oscilloscope.
      1. Scope A output (XY Panel) to Channel A input. "Connect the Scope A output from the XY Panel to the EXT TRIG input jack on the oscilloscope and set the Source switch on the oscilloscope to EXT."

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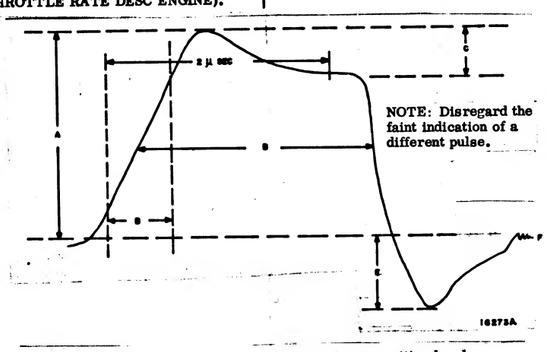
      2. Scope B output (XY Panel) to Channel B input on the scope. Set the MODE switch to A+B. Set scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)
19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)
21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

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indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.
24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)
25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to S-DIFF. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).
28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T+S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
29. Set the Frequency Counter Panel controls as follows:
   a. INPUT VOLTS RMS selector to 6.4
   b. TRIGGER LEVEL control to mid range
   c. TIME selector to MS
   d. DISPLAY fully CCW but not into detent position
   e. GATE switch to AUTO
   f. FUNCTION switch to A+B
   g. SLOPE to (+)
      NOTE: Disregard the PROG and TRACKER alarms during the following test.
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:
   a. Selector to 12
   b. STANDARD RATE pushbutton - press to light
   c. POSITIVE pushbutton - press to light
   d. OUT IN pushbutton - press to light
   e. Set C33-4, C33-5, C33-8 on RDC Panel.

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31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set the SCOPE switch on the XY Interface Panel to the T DIFF position. Measure and record the indication of A through F. (See Figure 1.) After completing measurements, return the SCOPE switch on the XY Interface Panel to the S→T position and the oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface panel to S DIFF. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR Z_A GATE STROBE). Set the FREQ + PHASE switch on the XY Interface panel to T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set the SCOPE switch on XY Interface panel to T DIFF. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437

LR V_Y READ CYCLE TIMING TEST

43. Reset the Frequency Counter. Set the CHANNEL T switches to 218 (LR V_Y GATE STROBE) and CHANNEL S switches to 314. Set the FREQ + PHASE switch on the XY Interface panel to T→S position.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S→T.

46. Determine and record the timing lag of a LR Y_A Gate Strobe pulse (T-218) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437

LR V_X READ CYCLE TIMING TEST

49. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR V_X GATE STROBE) and CHANNEL S switches to 314. Set FREQ + PHASE switch on XY Interface panel to T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of X_A data 03437 ENTR
c. Observe Row 1 indicated 00001
d. Observe Row 2 indicates 10437

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313. Set FREQ + PHASE switch on XY Interface panel to T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT). Set FREQ + PHASE switch on XY Interface panel to T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S→T. Measure and record the oscilloscope indications of A through F of Figure 1.

RR RANGE GATE STROBE TIMING TEST

64. Set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01750 ENTR
c. 11753 ENTR
d. NOUN 15 ENTR
e. 01755 ENTR ENTR
f. 04353 ENTR ENTR
g. 00100 ENTR ENTR
h. 77777 ENTR ENTR
i. 55753 ENTR ENTR
j. 31754 ENTR ENTR
k. 55000 ENTR ENTR
l. 25757 ENTR ENTR
m. 01750 ENTR
n. NOUN 01 ENTR
o. 00411 ENTR
p. 01000 ENTR
q. VERB 25 NOUN 26 ENTR
r. 04000 ENTR
s. 01750 ENTR
t. 00003 ENTR
u. VERB 30 ENTR
v. VERB 01 NOUN 01 ENTR
w. 01000 ENTR
x. Observe Row 1 indicates 77777
y. NOUN 01 ENTR
z. 01077 ENTR
aa. Observe Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press
b. WORD RATE 50 PPS pushbutton - press to light
c. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A +B. Set B switch to INVERT DC.
d. SCOPE switch to T DIFF.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A - B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface panel to T DIFF. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Preform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe
Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

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EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12621 REV. C INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	REC Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.u	RCS Jet +23F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1s	vdc	2.0		5.0		
9	RCS Jet +Z3F	vdc	9.0		11.0		
	RCS Jet -Z4F	vdc	9.0		11.0		
	RCS Jet -Z1F	vdc	9.0		11.0		
	RCS Jet +Z2F	vdc	9.0		11.0		
	RCS Jet +Y2s	vdc	9.0		11.0		
	RCS Jet -Y3S	vdc	9.0		11.0		
	RCS Jet -Y4S	vdc	9.0		11.0		
	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC NO. 12621 REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC NO. 12621
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.0		4.0		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.0		4.0		

DATE _____

FORM 00155
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC NO. 12621
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.0		4.0		
41.C	Dropo	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A.5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

DATE 15 MAR 66

FORM 00155
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 7

TEST HISTORY
DATE START ____ END ____ SYSTEM NO. ____
TIME START ____ END ____
OPERATOR ____

JDC NO. 12621
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate. Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.0		4.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

DATE 15 MAR 66

FORM 00155
New 9-30-65

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC NO. 12621
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			2.0		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73	Telemetry DLNK Data						
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.D	Droop	volts			A/5		
73.E	Rise Time	u sec			0.2		

DATE 15 MAR 66

FORM 00147
Chg. 7-23-65

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D. S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-

REFERENCES
PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
   a. DE MARGINS to NORM
   b. CHAN V METERS to DCVM
   c. CHANNEL V selector to 601
3. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
   c. Observe Row 1 indicates 00005
   d. Observe Row 2 indicates 00377

VERIFICATION WITH SIDL REQUIRED BEFORE USE

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
6. Repeat step 4.
7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.
9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.
11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.
12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.
15. Press the ENTR pushbutton on the DSKY.
16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:
   a. On XY Interface Panel set
      1. SCOPE switch to DIFF T.

   2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
   3. LOAD CHAN T 200 OHMS - press to test
   b. Connect coax jumpers as follows:
      1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
      2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
      3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.
   c. On Oscilloscope set
      1. SOURCE switch to EXT.
      2. MODE switch to A + B.
      3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)
19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)
21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

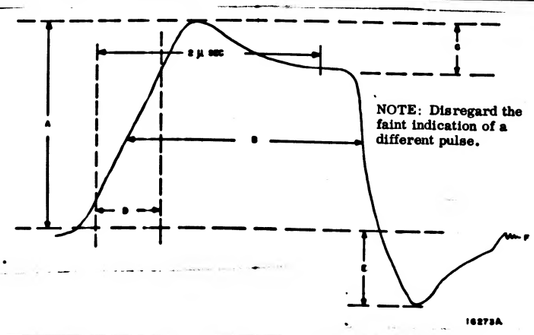
22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)
23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.
24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)
25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T→S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
29. Set the Frequency Counter Panel controls as follows:
   a. INPUT VOLTS RMS selector to 6.4
   b. TRIGGER LEVEL control to mid range
   c. TIME selector to MS
   d. DISPLAY fully CCW but not into detent position
   e. GATE switch to AUTO
   f. FUNCTION switch to A→B
   g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Set C33-4, C33-5, C33-8 on RDC Panel.

31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR

c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_X data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T. Measure and record the oscilloscope indications of A through F of Figure 1.

RR RANGE GATE STROBE TIMING TEST

64. Set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR	
b. 01750		ENTR	
c. 11753		ENTR	
d.	NOUN 15	ENTR	
e. 01755		ENTR	ENTR
f. 04353		ENTR	ENTR
g. 00100		ENTR	ENTR
h. 77777		ENTR	ENTR
i. 55753		ENTR	ENTR
j. 31754		ENTR	ENTR

k. 55000 ENTR ENTR
l. 25757 ENTR ENTR
m. 01750 ENTR
n. NOUN 01 ENTR
o. 00411 ENTR
p. 01000 ENTR
q. VERB 25 NOUN 26 ENTR
r. 04000 ENTR
s. 01750 ENTR
t. 00003 ENTR
u. VERB 30 ENTR
v. VERB 01 NOUN 01 ENTR
w. 01000 ENTR
x. Observe
Row 1 indicates 77777
y. NOUN 01 ENTR
z. 01077 ENTR
aa. Observe
Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light
b. WORD RATE 50 PPS pushbutton - press to light
c. Press 200 OHM LOAD pushbuttons for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A - B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Preform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe
Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7
JOB LGC OUTPUT TEST

JDC NO. 12621 REV. D INITIAL TDRR 27134

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	RCS Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.a	RCS Jet +Z3F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7
JOB LGC OUTPUT TEST

JDC NO. 12621 REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1S	vdc	2.0		5.0		
9.a	RCS Jet +Z3F	vdc	9.0		11.0		
9.b	RCS Jet -Z4F	vdc	9.0		11.0		
9.c	RCS Jet -Z1F	vdc	9.0		11.0		
9.d	RCS Jet +Z2F	vdc	9.0		11.0		
9.e	RCS Jet +Y2s	vdc	9.0		11.0		
9.f	RCS Jet -Y3S	vdc	9.0		11.0		
9.g	RCS Jet -Y4S	vdc	9.0		11.0		
9.h	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7
JOB LGC OUTPUT TEST

JDC NO. 12621 REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC NO. 12621 REV. D

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.0		4.0		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.0		4.0		

DATE

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC NO. 12621 REV. D

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.0		4.0		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC NO. 12621 REV. D

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.0		4.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC NO. 12621 REV. D

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

DATE 15 MAR 66

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-
E	8-10-67	34336	1, 8	-	EA	-

REFERENCES
PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:

a. DE MARGINS to NORM
b. CHAN V METERS to DCVM
c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00011 ENTR
c. Observe Row 2 indicates 00377
d. Observe Row 2 indicates 00377

VERIFICATION WITH SIDL REQUIRED BEFORE USE

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:

a. On XY Interface Panel set
1. SCOPE switch to DIFF T.

2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
3. LOAD CHAN T 200 OHMS - press to test

b. Connect coax jumpers as follows:
1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set
1. SOURCE switch to EXT.
2. MODE switch to A + B.
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

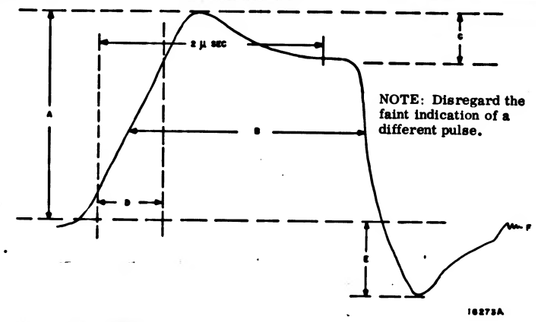
25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T→S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4
b. TRIGGER LEVEL control to mid range
c. TIME selector to MS
d. DISPLAY fully CCW but not into detent position
e. GATE switch to AUTO
f. FUNCTION switch to A→B
g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Set C33-4, C33-5, C33-8 on RDC Panel.

31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR

c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_X data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Repeat step 41. Measure and record the oscilloscope indications of A through F of Figure 1.

RR RANGE GATE STROBE TIMING TEST

64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY interface Panel to ALTERNATE S→T and set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01750		ENTR
c.	11753		ENTR
d.		NOUN 15	ENTR
e.	01755		ENTR ENTR
f.	04353		ENTR ENTR
g.	00100		ENTR ENTR
h.	77777		ENTR ENTR
i.	55753		ENTR ENTR
j.	31754		ENTR ENTR

k. 55000		ENTR	ENTR
l. 25757		ENTR	ENTR
m. 01750		ENTR	
n.	NOUN 01	ENTR	
o. 00411		ENTR	
p. 01000		ENTR	
q. VERB 25	NOUN 26	ENTR	
r. 04000		ENTR	
s. 01750		ENTR	
t. 00003		ENTR	
u. VERB 30		ENTR	
v. VERB 01	NOUN 01	ENTR	
w. 01000		ENTR	
x. Observe Row 1 indicates 77777			
y.	NOUN 01	ENTR	
z. 01077		ENTR	
aa. Observe Row 1 indicates 77777			

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light
b. WORD RATE 50 PPS pushbutton - press to light
c. Press 200 OHM LOAD pushbuttons for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A - B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Preform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12621 REV. E INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	RCS Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.a	RCS Jet +Z3F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1S	vdc	2.0		5.0		
9.a	RCS Jet +Z3F	vdc	9.0		11.0		
9.b	RCS Jet -Z4F	vdc	9.0		11.0		
9.c	RCS Jet -Z1F	vdc	9.0		11.0		
9.d	RCS Jet +Z2F	vdc	9.0		11.0		
9.e	RCS Jet +Y2s	vdc	9.0		11.0		
9.f	RCS Jet -Y3S	vdc	9.0		11.0		
9.g	RCS Jet -Y4S	vdc	9.0		11.0		
9.h	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC NO. 12621 REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC NO. 12621
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.0		4.0		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.0		4.0		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC NO. 12621
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.0		4.0		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC NO. 12621
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.0		4.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC NO. 12621
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D. S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-
E	8-10-67	34336	1, 8	-	EA	-
F	8-31-67	34459	9	-	EA	-

REFERENCES: PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
   a. DE MARGINS to NORM
   b. CHAN V METERS to DCVM
   c. CHANNEL V selector to 601
3. Perform the following DSKY operations:
   a. VERB 57 ENTR
   b. 00011 ENTR
   c. Observe Row 2 indicates 00377
   d. Observe Row 2 indicates 00377

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:
   a. On XY Interface Panel set
      1. SCOPE switch to DIFF T.

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   2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
   3. LOAD CHAN T 200 OHMS - press to test
   b. Connect coax jumpers as follows:
      1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
      2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
      3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.
   c. On Oscilloscope set
      1. SOURCE switch to EXT.
      2. MODE switch to A + B.
      3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).

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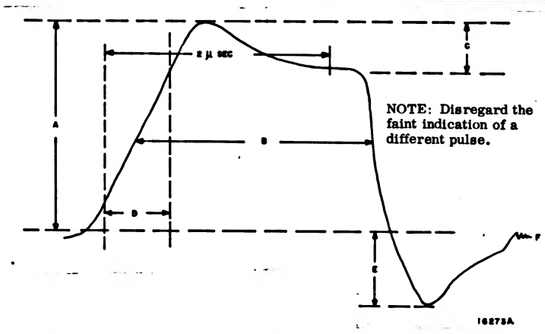

A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T→S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:
   a. INPUT VOLTS RMS selector to 6.4
   b. TRIGGER LEVEL control to mid range
   c. TIME selector to MS
   d. DISPLAY fully CCW but not into detent position
   e. GATE switch to AUTO
   f. FUNCTION switch to A→B
   g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

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30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Set C33-4, C33-5, C33-8 on RDC Panel.

31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR

c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_X data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Repeat step 41. Measure and record the oscilloscope indications of A through F of Figure 1.

RR RANGE GATE STROBE TIMING TEST

64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T and set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01750		ENTR
c.	11753		ENTR
d.		NOUN 15	ENTR
e.	01755		ENTR ENTR
f.	04353		ENTR ENTR
g.	00100		ENTR ENTR
h.	77777		ENTR ENTR
i.	55753		ENTR ENTR
j.	31754		ENTR ENTR

k. 55000 ENTR ENTR
l. 25757 ENTR ENTR
m. 01750 ENTR
n. NOUN 01 ENTR
o. 00411 ENTR
p. 01000 ENTR
q. VERB 25 NOUN 26 ENTR
r. 04000 ENTR
s. 01750 ENTR
t. 00003 ENTR
u. VERB 30 ENTR
v. VERB 01 NOUN 01 ENTR
w. 01000 ENTR
x. Observe
Row 1 indicates 77777
y. NOUN 01 ENTR
z. 01077 ENTR
aa. Observe
Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light
b. WORD RATE 50 PPS pushbutton - press to light
c. Press 200 OHM LOAD pushbuttons for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Preform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe
Row 1 indicates X3XXX

76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

77. Perform the following DSKY operations:

a. VERB 36 ENTR

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EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12621 REV. F INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	RCS Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.a	RCS Jet +Z3F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1S	vdc	2.0		5.0		
9.a	RCS Jet +Z3F	vdc	9.0		11.0		
9.b	RCS Jet -Z4F	vdc	9.0		11.0		
9.c	RCS Jet -Z1F	vdc	9.0		11.0		
9.d	RCS Jet +Z2F	vdc	9.0		11.0		
9.e	RCS Jet +Y2s	vdc	9.0		11.0		
9.f	RCS Jet -Y3S	vdc	9.0		11.0		
9.g	RCS Jet -Y4S	vdc	9.0		11.0		
9.h	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

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EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC NO. 12621 REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

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DATA SHEET 4 OF 7

JDC NO. 12621 REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.0		4.0		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.0		4.0		

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EQUIPMENT TEST
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JDC NO. 12621 REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.0		4.0		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC NO. 12621 REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.0		4.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC NO. 12621
REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

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FORM 01-7
Chg. 7-23-65

DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-
E	8-10-67	34336	1, 8	-	EA	-
F	8-31-67	34459	9	-	EA	-
G	2-6-68	35562	1	-	EA	-

REFERENCES
PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:

a. DE MARGINS to NORM
b. CHAN V METERS to DCVM
c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00011 ENTR
c. Observe Row 1 indicates 00005 _____
d. Observe Row 2 indicates 00377 _____

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:

a. On XY Interface Panel set
1. SCOPE switch to DIFF T.

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2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
3. LOAD CHAN T 200 OHMS - press to test

b. Connect coax jumpers as follows:
1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set
1. SOURCE switch to EXT.
2. MODE switch to A + B.
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).

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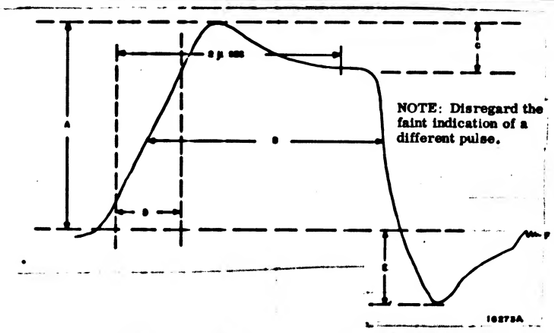

A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T+S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4
b. TRIGGER LEVEL control to mid range
c. TIME selector to MS
d. DISPLAY fully CCW but not into detent position
e. GATE switch to AUTO
f. FUNCTION switch to A→B
g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

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30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Set C33-4, C33-5, C33-8 on RDC Panel.

31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR

c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_X data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Repeat step 41. Measure and record the oscilloscope indications of A through F of Figure 1.

RR RANGE GATE STROBE TIMING TEST

64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY interface Panel to ALTERNATE S→T and set the CHANNEL S switches to 105.

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR
b.	01750		ENTR
c.	11753		ENTR
d.		NOUN 15	ENTR
e.	01755		ENTR ENTR
f.	04353		ENTR ENTR
g.	00100		ENTR ENTR
h.	77777		ENTR ENTR
i.	55753		ENTR ENTR
j.	31754		ENTR ENTR

k. 55000		ENTR	ENTR
l. 25757		ENTR	ENTR
m. 01750		ENTR	
n.	NOUN 01	ENTR	
o. 00411		ENTR	
p. 01000		ENTR	
q. VERB 25	NOUN 26	ENTR	
r. 04000		ENTR	
s. 01750		ENTR	
t. 00003		ENTR	
u. VERB 30		ENTR	
v. VERB 01	NOUN 01	ENTR	
w. 01000		ENTR	
x. Observe Row 1 indicates 77777			
y.	NOUN 01	ENTR	
z. 01077		ENTR	
aa. Observe Row 1 indicates 77777			

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light
b. WORD RATE 50 PPS pushbutton - press to light
c. Press 200 OHM LOAD pushbuttons for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Preform the following DSKY operations:

a. VERB 01	NOUN 10	ENTR
b. 00033		ENTR
c. Observe Row 1 indicates X3XXX		

76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

77. Perform the following DSKY operations:

a. VERB 36	ENTR

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JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	RCS Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.a	RCS Jet +Z3F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

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JDC NO. 12621 REV. G

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0		
7.d	RCS Jet +Z2F	vdc	2.0		5.0		
7.e	RCS Jet +Y2S	vdc	2.0		5.0		
7.f	RCS Jet -Y3S	vdc	2.0		5.0		
7.g	RCS Jet -Y4S	vdc	2.0		5.0		
7.h	RCS Jet -Y1S	vdc	2.0		5.0		
9.a	RCS Jet +Z3F	vdc	9.0		11.0		
9.b	RCS Jet -Z4F	vdc	9.0		11.0		
9.c	RCS Jet -Z1F	vdc	9.0		11.0		
9.d	RCS Jet +Z2F	vdc	9.0		11.0		
9.e	RCS Jet +Y2s	vdc	9.0		11.0		
9.f	RCS Jet -Y3S	vdc	9.0		11.0		
9.g	RCS Jet -Y4S	vdc	9.0		11.0		
9.h	RCS Jet -Y1s	vdc	9.0		11.0		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16	+Pitch Gimbal Trim	vdc	9.0		11.0		
	-Pitch Gimbal Trim	vdc	9.0		11.0		
	+Roll Gimbal Trim	vdc	9.0		11.0		
	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	0		0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	0		0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

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JDC NO. 12621
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.0		4.0		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.0		4.0		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.0		4.0		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.0		4.0		

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JDC NO. 12621
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.0		4.0		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.0		4.0		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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JDC NO. 12621
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.0		4.0		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.0		4.0		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.0		4.0		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		

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JDC NO. 12621
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-
E	8-10-67	34336	1, 8	-	EA	-
F	8-31-67	34459	9	-	EA	-
G	2-6-68	35562	1	-	EA	-
H	4-10-68	36049	1-5, 8-10	All	EA	-

REFERENCES
PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:

a. DE MARGINS to NORM
b. CHAN V METERS to DCVM
c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00011 ENTR

VERIFICATION WITH SIOL REQUIRED BEFORE USE

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c. Observe
Row 1 indicates 00005
d. Observe
Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	+Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:

a. On XY Interface Panel set

1. SCOPE switch to DIFF T.
3. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
3. LOAD CHAN T 200 OHMS - press to light

b. Connect coax jumpers as follows:
1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set
1. SOURCE switch to EXT.
2. MODE switch to A + B.
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

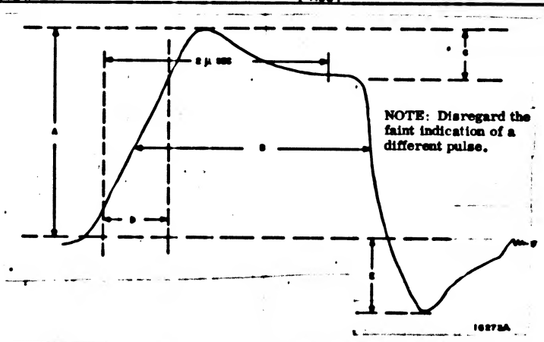
25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T TeS. Connect a coax jumper to CNTR-A and FREQ A AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4
b. TRIGGER LEVEL control to mid range
c. TIME selector to MS
d. DISPLAY fully CCW but not into detent position
e. GATE switch to AUTO
f. FUNCTION switch to TIME A→B
g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Press to light CH33-4, CH33-5, CH 33-6 pushbuttons on RDC Interface panel.

31. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00014 ENTR
c. VERB 33 ENTR

Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR

c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_X data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Repeat step 41.

RR RANGE GATE STROBE TIMING TEST

64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to ALTERNATE S→T and set the CHANNEL S switches to 105

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a. VERB 21	NOUN 01	ENTR	
b. 01750		ENTR	
c. 11753		ENTR	
d.	NOUN 15	ENTR	
e. 01755		ENTR	ENTR
f. 04353		ENTR	ENTR
g. 00100		ENTR	ENTR
h. 77777		ENTR	ENTR
i. 55753		ENTR	ENTR
j. 31754		ENTR	ENTR

k. 55000		ENTR	ENTR
l. 25757		ENTR	ENTR
m. 01750		ENTR	
n.	NOUN 01	ENTR	
o. 00411		ENTR	
p. 01000		ENTR	
q. VERB 25	NOUN 26	ENTR	
r. 04000		ENTR	
s. 01750		ENTR	
t. 00003		ENTR	
u. VERB 30		ENTR	
v. VERB 01	NOUN 01	ENTR	
w. 01000		ENTR	
x. Observe Row 1 indicates 77777			
y.	NOUN 01	ENTR	
z. 01077		ENTR	
aa. Observe Row 1 indicates 77777			

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light
b. WORD RATE 50 PPS pushbutton - press to light
c. Press LOAD CHAN S 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

a. VERB 01	NOUN 10	ENTR
b. 00033		ENTR
c. Observe Row 1 indicates X3XXX		

76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the WORD RATE 50 PPS pushbutton. The pushbutton shall light. Press the WORD RATE 300 PPS pushbutton. The pushbutton shall go out.

77. Perform the following DSKY operations:

a. VERB 36		ENTR

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EQUIPMENT TEST
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JDC NO. 12621 REV. H INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START / END / SITE / LOCATION
SER. NO. / DWG / REV.	TIME START / END / TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME / SER. NO. / CAL DATE
NAME / SER. NO. / CAL DATE

CONDUCTED BY (NAME/AFFILIATION) APPROVED BY (NAME/AFFILIATION)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	3.0		6.0		
4.b	RCS Jet +X4D	vdc	3.0		6.0		
4.c	RCS Jet -X3U	vdc	3.0		6.0		
4.d	RCS Jet +X3D	vdc	3.0		6.0		
4.e	RCS Jet -X2U	vdc	3.0		6.0		
4.f	RCS Jet +X2D	vdc	3.0		6.0		
4.g	RCS Jet -X1U	vdc	3.0		6.0		
4.h	RCS Jet +X1D	vdc	3.0		6.0		
6.a	RCS Jet -X4U	vdc	9.1		10.1		
6.b	RCS Jet +X4D	vdc	9.1		10.1		
6.c	RCS Jet -X3U	vdc	9.1		10.1		
6.d	RCS Jet +X3D	vdc	9.1		10.1		
6.e	RCS Jet -X2U	vdc	9.1		10.1		
6.f	RCS Jet +X2D	vdc	9.1		10.1		
6.g	RCS Jet -X1U	vdc	9.1		10.1		
6.h	RCS Jet +X1D	vdc	9.1		10.1		
7.a	RCS Jet +Z3F	vdc	3.0		6.0		
7.b	RCS Jet -Z4F	vdc	3.0		6.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. H

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	3.0		6.0		
7.d	RCS Jet +Z2F	vdc	3.0		6.0		
7.e	RCS Jet +Y2S	vdc	3.0		6.0		
7.f	RCS Jet -Y3S	vdc	3.0		6.0		
7.g	RCS Jet -Y4S	vdc	3.0		6.0		
7.h	RCS Jet +Y1X	vdc	3.0		6.0		
9.a	RCS Jet +Z3F	vdc	9.1		10.1		
9.b	RCS Jet -Z4F	vdc	9.1		10.1		
9.c	RCS Jet -Z1F	vdc	9.1		10.1		
9.d	RCS Jet +Z2F	vdc	9.1		10.1		
9.e	RCS Jet +Y2S	vdc	9.1		10.1		
9.f	RCS Jet -Y3S	vdc	9.1		10.1		
9.g	RCS Jet -Y4S	vdc	9.1		10.1		
9.h	RCS Jet +Y1S	vdc	9.1		10.1		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16.a	+Pitch Gimbal Trim	vdc	9.0		11.0		
16.b	-Pitch Gimbal Trim	vdc	9.0		11.0		
16.c	+Roll Gimbal Trim	vdc	9.0		11.0		
16.d	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

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EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC NO. 12621 REV. H

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise	P-PV	-4.0		+0.4		
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise	P-PV	-4.0		+0.4		
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		

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EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC NO. 12621 REV. H

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.5		3.5		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.5		3.5		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.5		3.5		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.5		3.5		

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Chg. 1-23-65

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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.5		3.5		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.5		3.5		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		

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JDC NO. 12621 REV. H

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.5		3.5		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.5		3.5		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.5		3.5		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.5		3.5		
66.C	Droop	volts			A/5		

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JDC NO. 12621
REV H

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	5.0		9.0		
71.B	Pulse Width	u sec	2.0		6.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

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FORM 1001-7
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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	8-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-
E	8-10-67	34336	1, 8	-	EA	-
F	8-31-67	34459	9	-	EA	-
G	2-6-68	35562	1	-	EA	-
H	4-10-68	36049	1-5, 8-10	All	EA	-
J	7-29-68	36598	4, 5	3	EA	-

REFERENCES
PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows

a. DE MARGINS to NORM
b. CHAN V METERS to DCVM
c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00011 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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c. Observe
Row 1 indicates 00005 ____
d. Observe
Row 2 indicates 00377 ____

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	+Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:

a. On XY Interface Panel set

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1. SCOPE switch to DIFF T.
2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
3. LOAD CHAN T 200 OHMS - press to light

b. Connect coax jumpers as follows:

1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set

1. SOURCE switch to EXT.
2. MODE switch to A + B.
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).

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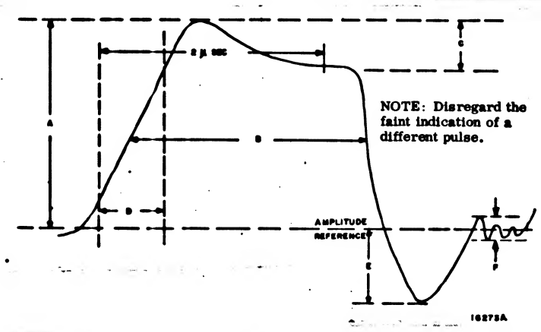

A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T Test. Connect a coax jumper to CNTR-A and FREQ A AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4
b. TRIGGER LEVEL control to mid range
c. TIME selector to MS
d. DISPLAY fully CCW but not into detent position
e. GATE switch to AUTO
f. FUNCTION switch to TIME A→B
g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

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30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Press to light CH33-4, CH33-5, CH33-8 pushbuttons on RDC Interface panel.

31. Perform the following DSKY operations:

a.	VERB 24	NOUN 01	ENTR
b.	00035		ENTR
c.	00000		ENTR
d.	00000		ENTR
e.	VERB 57		ENTR
f.	00014		ENTR
g.	VERB 33		ENTR

Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a.	VERB 14	NOUN 01	ENTR
b.	Address of LR Range data 03437		ENTR
c.	Observe Row 1 indicates 00011		
d.	Observe Row 2 indicates 37653		

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a.	VERB 14	NOUN 01	ENTR
b.	Address of V_Z data 03437		ENTR
c.	Observe Row 1 indicates 00001		
d.	Observe Row 2 indicates 10437 (07777)		

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a.	VERB 14	NOUN 01	ENTR
b.	Address of V_Y data 03437		ENTR

c.	Observe Row 1 indicates 00001		
d.	Observe Row 2 indicates 10437 (07777)		

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a.	VERB 14	NOUN 01	ENTR
b.	Address of V_X data 03437		ENTR
c.	Observe Row 1 indicates 00001		
d.	Observe Row 2 indicates 10437 (07777)		

LR V_X READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 106. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a.	VERB 14	NOUN 01	ENTR
b.	Address of RR Range data 03437		ENTR
c.	Observe Row 1 indicates 77777		
d.	Observe Row 2 indicates 36627		

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Repeat step 41.

RR RANGE GATE STROBE TIMING TEST

64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to ALTERNATE S→T and set the CHANNEL S switches to 105

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a.	VERB 14	NOUN 01	ENTR
b.	Address of RR Range data 03437		ENTR
c.	Observe Row 1 indicates 00017		
d.	Observe Row 2 indicates 37770		

68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a.	VERB 21	NOUN 01	ENTR	
b.	01750		ENTR	
c.	11753		ENTR	
d.		NOUN 15	ENTR	
e.	01755		ENTR	ENTR
f.	04353		ENTR	ENTR
g.	00100		ENTR	ENTR
h.	77777		ENTR	ENTR
i.	55753		ENTR	ENTR
j.	31754		ENTR	ENTR

k. 55000		ENTR	ENTR
l. 25757		ENTR	ENTR
m. 01750		ENTR	
n.	NOUN 01	ENTR	
o. 00411		ENTR	
p. 01000		ENTR	
q. VERB 25	NOUN 26	ENTR	
r. 04000		ENTR	
s. 01750		ENTR	
t. 00003		ENTR	
u. VERB 30		ENTR	
v. VERB 01	NOUN 01	ENTR	
w. 01000		ENTR	
x. Observe Row 1 indicates 77777			
y.	NOUN 01	ENTR	
z. 01077		ENTR	
aa. Observe Row 1 indicates 77777			

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light

b. WORD RATE 50 PPS pushbutton - press to light

c. Press LOAD CHAN S 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.

d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

a. VERB 01	NOUN 10	ENTR
b. 00033		ENTR
c. Observe Row 1 indicates X3XXX		

76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the WORD RATE 50 PPS pushbutton. The pushbutton shall light. Press the WORD RATE 300 PPS pushbutton. The pushbutton shall go out.

77. Perform the following DSKY operations:

a. VERB 36		ENTR

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DATA SHEET 1 OF 7

JDC NO. 12621 REV. J INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE	DATE START END SITE / LOCATION
SER. NO. DWG REV.	TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	3.0		6.0		
4.b	RCS Jet +X4D	vdc	3.0		6.0		
4.c	RCS Jet -X3U	vdc	3.0		6.0		
4.d	RCS Jet +X3D	vdc	3.0		6.0		
4.e	RCS Jet -X2U	vdc	3.0		6.0		
4.f	RCS Jet +X2D	vdc	3.0		6.0		
4.g	RCS Jet -X1U	vdc	3.0		6.0		
4.h	RCS Jet +X1D	vdc	3.0		6.0		
6.a	RCS Jet -X4U	vdc	9.1		10.1		
6.b	RCS Jet +X4D	vdc	9.1		10.1		
6.c	RCS Jet -X3U	vdc	9.1		10.1		
6.d	RCS Jet +X3D	vdc	9.1		10.1		
6.e	RCS Jet -X2U	vdc	9.1		10.1		
6.f	RCS Jet +X2D	vdc	9.1		10.1		
6.g	RCS Jet -X1U	vdc	9.1		10.1		
6.h	RCS Jet +X1D	vdc	9.1		10.1		
7.a	RCS Jet +Z3F	vdc	3.0		6.0		
7.b	RCS Jet -Z4F	vdc	3.0		6.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	3.0		6.0		
7.d	RCS Jet -Z2F	vdc	3.0		6.0		
7.e	RCS Jet +Y2S	vdc	3.0		6.0		
7.f	RCS Jet -Y3S	vdc	3.0		6.0		
7.g	RCS Jet -Y4S	vdc	3.0		6.0		
7.h	RCS Jet +Y1X	vdc	3.0		6.0		
9.a	RCS Jet +Z3F	vdc	9.1		10.1		
9.b	RCS Jet -Z4F	vdc	9.1		10.1		
9.c	RCS Jet -Z1F	vdc	9.1		10.1		
9.d	RCS Jet +Z2F	vdc	9.1		10.1		
9.e	RCS Jet +Y2S	vdc	9.1		10.1		
9.f	RCS Jet -Y3S	vdc	9.1		10.1		
9.g	RCS Jet -Y4S	vdc	9.1		10.1		
9.h	RCS Jet +Y1S	vdc	9.1		10.1		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16.a	+Pitch Gimbal Trim	vdc	9.0		11.0		
16.b	-Pitch Gimbal Trim	vdc	9.0		11.0		
16.c	+Roll Gimbal Trim	vdc	9.0		11.0		
16.d	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

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EQUIPMENT TEST
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JDC NO. 12621 REV J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise above reference	P-PV			+0.4		
	Noise below. reference	P-PV	-4.0				
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise above reference	P-PV			+0.4		
	Noise below reference	P-PV	-4.0				
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		

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JDC NO. 12621 REV J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.5		3.5		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.5		3.5		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.5		3.5		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		

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JDC NO. 12621 REV J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.5		3.5		
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.5		3.5		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.5		3.5		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		

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EQUIPMENT TEST
DATA SHEET 6 OF 7

JDC NO. 12621 REV J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.5		3.5		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.5		3.5		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.5		3.5		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		

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EQUIPMENT TEST
DATA SHEET 7 OF 7

JDC
NO. 12621
REV J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.5		3.5		
66.C	Droop	volts			A/5		
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	5.0		9.0		
71.B	Pulse Width	u sec	2.0		6.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA
A	3-10-66	30551	All	All	EA	-
B	10-6-66	31443	2-9	4-6	EA	-
C	11-25-66	32062	2-9	3, 6	EA	-
D	6-30-67	34038	All	1, 2, 5, 7	EA	-
E	9-10-67	34336	1, 8	-	EA	-
F	8-31-67	34459	9	-	EA	-
G	2-6-68	35562	1	-	EA	-
H	4-10-68	36049	1-5, 8-10	All	EA	-
J	7-29-68	36598	4, 5	3	EA	-
K	9-20-68	36845	8, 9, 10	-	EA	-

REFERENCES
PS 6015000, JDC 12613

IMPORTANT

INTERVAL

TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

CTS SWITCH INITIALIZATION

2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows

a. DE MARGINS to NORM
b. CHAN V METERS to DCVM
c. CHANNEL V selector to 601

3. Perform the following DSKY operations:

a. VERB 57 ENTR
b. 00011 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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c. Observe
Row 1 indicates 00005
d. Observe
Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	+Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

	CHANNEL V	GIMBAL TRIM
a.	406	+Pitch
b.	501	-Pitch
c.	504	+Roll
d.	617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:

a. On XY Interface Panel set

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1. SCOPE switch to DIFF T.
2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
3. LOAD CHAN T 200 OHMS - press to light

b. Connect coax jumpers as follows:
1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set
1. SOURCE switch to EXT.
2. MODE switch to A + B.
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S. Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READOUTS).

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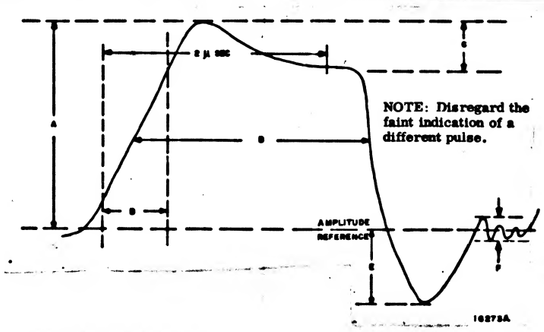

A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Droop: measured from pulse maximum positive level to level at 2 microseconds
D - Rise Time: time required for pulse to rise from 10% to 90% of A
E - Backswing: measured to signal maximum negative level
F - Noise: (No Pulse)

Figure1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T+S. Connect a coax jumper to CNTR-A and FREQ A AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

a. INPUT VOLTS RMS selector to 6.4
b. TRIGGER LEVEL control to mid range
c. TIME selector to MS
d. DISPLAY fully CCW but not into detent position
e. GATE switch to AUTO
f. FUNCTION switch to TIME A→B
g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

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30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

a. Selector to 12
b. STANDARD RATE pushbutton - press to light
c. POSITIVE pushbutton - press to light
d. OUT IN pushbutton - press to light
e. Press to light CH33-4, CH33-5, CH33-8 pushbuttons on RDC Interface panel.

31. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR
b. 00035 ENTR
c. 00000 ENTR
d. 00000 ENTR
e. VERB 57 ENTR
f. 00014 ENTR
g. VERB 33 ENTR

Record the counter indication.

NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.

LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of LR Range data 03437 ENTR
c. Observe Row 1 indicates 00011
d. Observe Row 2 indicates 37653

READ CYCLE TIMING TEST LR V_Z

37. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 219 (LR V_Z GATE STROBE) and FREQ + PHASE to FR T T→S.

38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_Z GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

40. Determine and record the Timing lag of a LR V_Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Z GATE STROBE TEST

41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.

LR V_Z DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.

42. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Z data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_Y READ CYCLE TIMING TEST

43. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 218 (LR V_Y GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.

LR V_Y GATE STROBE TIMING TEST

45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

46. Determine and record the timing lag of a LR V_Y Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V_Y STROBE TEST

47. Repeat step 41.

LR V_Y DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.

48. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_Y data 03437 ENTR

c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

LR V_X READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 217 (LR V_X GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T→S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V_X GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V_X Gate Strobe pulse (T-217) to a LR Reset strobe pulse (S-118) at their respective A/2 points.

LR V_X GATE STROBE TEST

53. Repeat step 41.

LR V_X DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of V_X data 03437 ENTR
c. Observe Row 1 indicates 00001
d. Observe Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T→S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T213) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

RR RANGE RATE DATA ACQUISITION TEST

60. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 77777
d. Observe Row 2 indicates 36627

RR RANGE READ CYCLE TIMING TEST

61. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T→S.

62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR SYNC FOR READOUT STROBE TEST

63. Repeat step 41.

RR RANGE GATE STROBE TIMING TEST

64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to ALTERNATE S→T and set the CHANNEL S switches to 105

65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

66. Repeat step 41.

RR RANGE DATA ACQUISITION TEST

67. Perform the following DSKY operations:

a. VERB 14 NOUN 01 ENTR
b. Address of RR Range data 03437 ENTR
c. Observe Row 1 indicates 00017
d. Observe Row 2 indicates 37770

68. Deactivate all switches on the XY Interface Panel. Perform the following DSKY operations:

a. VERB 33 ENTR
b. VERB 36 ENTR

DOWN LINK TELEMETRY TEST

69. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR
b. 01750 ENTR
c. 11753 ENTR
d. NOUN 15 ENTR
e. 01755 ENTR ENTR
f. 04353 ENTR ENTR
g. 00100 ENTR ENTR
h. 77777 ENTR ENTR
i. 55753 ENTR ENTR
j. 31754 ENTR ENTR

k. 55000 ENTR ENTR
l. 25757 ENTR ENTR
m. 01750 ENTR
n. NOUN 01 ENTR
o. 00411 ENTR
p. 01000 ENTR
q. VERB 25 NOUN 26 ENTR
r. 04000 ENTR
s. 01750 ENTR
t. 00003 ENTR
u. VERB 30 ENTR
v. VERB 01 NOUN 01 ENTR
w. 01000 ENTR
x. Observe
Row 1 indicates 77777
y. NOUN 01 ENTR
z. 01077 ENTR
aa. Observe
Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light
b. WORD RATE 50 PPS pushbutton - press to light
c. Press LOAD CHAN S 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton. the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press to light WORD RATE 300 PPS pushbutton and press to extinguish WORD RATE 10 PPS pushbutton. When KEY REL indicator on DSKY flashes, press KEY REL pushbutton. Observe the DSKY displays VERB 05 NOUN 31, Row 1 indicates 01105, and PROG indicator is lighted.

75. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR
b. 00033 ENTR
c. Observe
Row 1 indicates X3XXX

76. Deactivate all switches and pushbuttons on the XY Interface Panel and the RDC Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press to light the WORD RATE 50 PPS and the DL ENABLE pushbuttons. Insure that the WORD RATE 300 PPS pushbutton is out.

77. Perform the following DSKY operations:

a. VERB 36 ENTR

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EQUIPMENT TEST
DATA SHEET 1 OF 7

JDC NO. 12621 REV. K INITIAL TORR 27 [illegible]

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST
TITLE
SER. NO. DWG REV.

TEST HISTORY
DATE START END SITE / LOCATION
TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT
NAME SER. NO. CAL DATE
NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a	RCS Jet -X4U	vdc	3.0		6.0		
4.b	RCS Jet +X4D	vdc	3.0		6.0		
4.c	RCS Jet -X3U	vdc	3.0		6.0		
4.d	RCS Jet +X3D	vdc	3.0		6.0		
4.e	RCS Jet -X2U	vdc	3.0		6.0		
4.f	RCS Jet +X2D	vdc	3.0		6.0		
4.g	RCS Jet -X1U	vdc	3.0		6.0		
4.h	RCS Jet +X1D	vdc	3.0		6.0		
6.a	RCS Jet -X4U	vdc	9.1		10.1		
6.b	RCS Jet +X4D	vdc	9.1		10.1		
6.c	RCS Jet -X3U	vdc	9.1		10.1		
6.d	RCS Jet +X3D	vdc	9.1		10.1		
6.e	RCS Jet -X2U	vdc	9.1		10.1		
6.f	RCS Jet +X2D	vdc	9.1		10.1		
6.g	RCS Jet -X1U	vdc	9.1		10.1		
6.h	RCS Jet +X1D	vdc	9.1		10.1		
7.a	RCS Jet +Z3F	vdc	3.0		6.0		
7.b	RCS Jet -Z4F	vdc	3.0		6.0		

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EQUIPMENT TEST
DATA SHEET 2 OF 7

JDC NO. 12621 REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	3.0		6.0		
7.d	RCS Jet +Z2F	vdc	3.0		6.0		
7.e	RCS Jet +Y2S	vdc	3.0		6.0		
7.f	RCS Jet -Y3S	vdc	3.0		6.0		
7.g	RCS Jet -Y4S	vdc	3.0		6.0		
7.h	RCS Jet +Y1X	vdc	3.0		6.0		
9.a	RCS Jet +Z3F	vdc	9.1		10.1		
9.b	RCS Jet -Z4F	vdc	9.1		10.1		
9.c	RCS Jet -Z1F	vdc	9.1		10.1		
9.d	RCS Jet +Z2F	vdc	9.1		10.1		
9.e	RCS Jet +Y2S	vdc	9.1		10.1		
9.f	RCS Jet -Y3S	vdc	9.1		10.1		
9.g	RCS Jet -Y4S	vdc	9.1		10.1		
9.h	RCS Jet +Y1S	vdc	9.1		10.1		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16.a	+Pitch Gimbal Trim	vdc	9.0		11.0		
16.b	-Pitch Gimbal Trim	vdc	9.0		11.0		
16.c	+Roll Gimbal Trim	vdc	9.0		11.0		
16.d	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

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EQUIPMENT TEST
DATA SHEET 3 OF 7

JDC NO. 12621 REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
18B	Pulse Width	u sec	2.0		4.0		
18C	Droop	volts			A/5		
18D	Rise Time	u sec			0.20		
18E	Backswing	volts			4.0		
18F	Noise above reference	P-PV			+0.4		
	Noise below reference	P-PV	-4.0				
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	u sec	2.0		4.0		
20C	Droop	volts			A/5		
20D	Rise Time	u sec			0.20		
20E	Backswing	volts			4.0		
20F	Noise above reference	P-PV			+0.4		
	Noise below reference	P-PV	-4.0				
22.a.A	Amplitude	volts	4.0		10.0		
22.a.B	Pulse Width	u sec	2.0		4.0		
22.a.C	Droop	volts			A/5		
22.a.D	Rise Time	u sec			0.2		
22.a.E	Backswing	volts			4.0		
22.b.A	Amplitude	volts	4.0		10.0		
22.b.B	Pulse Width	u sec	2.0		4.0		
22.b.C	Droop	volts			A/5		
22.b.D	Rise Time	u sec			0.2		
22.b.E	Backswing	volts			4.0		
24.a.A	Amplitude	volts	4.0		10.0		
24.a.B	Pulse Width	u sec	2.0		4.0		

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EQUIPMENT TEST
DATA SHEET 4 OF 7

JDC NO. 12621 REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
24.a.C	Droop	volts			A/5		
24.a.D	Rise Time	u sec			.2		
24.a.E	Backswing	volts			4.0		
24.b.A	Amplitude	volts	4.0		10.0		
24.b.B	Pulse Width	u sec	2.0		4.0		
24.b.C	Droop	volts			A/5		
24.b.D	Rise Time	u sec			.2		
24.b.E	Backswing	volts			4.0		
26.a.A	Amplitude	volts	4.0		10.0		
26.a.B	Pulse Width	u sec	2.5		3.5		
26.a.C	Droop	volts			A/5		
26.a.D	Rise Time	u sec			.2		
26.a.E	Backswing	volts			4.0		
26.a.F	Noise	volts	0		.4		
26.b.A	Amplitude	volts	4.0		10.0		
26.b.B	Pulse Width	u sec	2.5		3.5		
26.b.C	Droop	volts			A/5		
26.b.D	Rise Time	u sec			.2		
26.b.E	Backswing	volts			4.0		
26.b.F	Noise	volts	0		.4		
31.	LR Range Read Cycle Timing	m sec	80.315				
32.A	Amplitude	volts	4.0		10.0		
32.B	Pulse Width	u sec	2.5		3.5		
32.C	Droop	volts			A/5		
32.D	Rise Time	u sec			0.20		
32.E	Backswing	volts			4.0		
32.F	Noise	volts	0		0.4		

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EQUIPMENT TEST
DATA SHEET 5 OF 7

JDC NO. 12621 REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	LR Range Gate Strobe Timing	u sec	1.75		2.25		
35.A	Amplitude	volts	4.0		10.0		
35.B	Pulse Width	u sec	2.5		3.5		
35.C	Droop	volts			A/5		
35.D	Rise Time	u sec			0.20		
35.E	Backswing	volts			4.0		
35.F	Noise	volts	0		0.4		
38	LR V_Z Read Cycle Timing	m sec	80.315				
40	LR V_Z Gate Strobe Timing	u sec	1.75		2.25		
41.A	Amplitude	volts	4.0		10.0		
41.B	Pulse Width	u sec	2.5		3.5		
41.C	Droop	volts			A/5		
41.D	Rise Time	u sec			0.20		
41.E	Backswing	volts			4.0		
41.F	Noise	volts	0		0.4		
44	LR V_Y Read Cycle Timing	m sec	80.315				
46	LR V_Y Gate Strobe Timing	u sec	1.75		2.25		
47.A	Amplitude	volts	4.0		10.0		
47.B	Pulse Width	u sec	2.5		3.5		
47.C	Droop	volts			A/5		
47.D	Rise Time	u sec			.20		
47.E	Backswing	volts			4.0		
47.F	Noise	volts	0		0.4		

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JDC NO. 12621 REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
50	LR V_X Read Cycle Timing	m sec	80.315				
52	LR V_X Gate Strobe Timing	u sec	1.75		2.25		
53.A	Amplitude	volts	4.0		10.0		
53.B	Pulse Width	u sec	2.5		3.5		
53.C	Droop	volts			A/5		
53.D	Rise Time	u sec			0.2		
53.E	Backswing	volts			4.0		
53.F	Noise	P-PV	0		0.4		
56	RR Range Rate Read Cycle Timing	m sec	80.935				
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25		
59.A	Amplitude	volts	4.0		10.0		
58.B	Pulse Width	u sec	2.5		3.5		
59.C	Droop	volts			A/5		
59.D	Rise Time	u sec			0.2		
59.E	Backswing	volts			4.0		
59.F	Noise	P-PV	0		0.4		
62	RR Range Read Cycle Timing	m sec	80.935				
63.A	Amplitude	volts	4.0		10.0		
63.B	Pulse Width	u sec	2.5		3.5		
63.C	Droop	volts			A/5		
63.D	Rise Time	u sec			0.2		
63.E	Backswing	volts			4.0		
63.F	Noise	P-PV	0		0.4		

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EQUIPMENT TEST
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JDC
NO. 12621
REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.5		3.5		
66.C	Droop	volts			A/5		
66.D	Rise Time	u sec			.20		
66.E	Backswing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	5.0		9.0		
71.B	Pulse Width	u sec	2.0		6.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			0.2		
71.E	Backswing	volts			4.0		
72	DLNK Data Sync Delay Time	u sec			1 u sec		
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.C	Droop	volts			A/5		
73.D	Rise Time	u sec			0.2		
73.E	Backswing	volts			4.0		

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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED JDC	PAGES REVISED D.S.	APPROVAL MIT	APPROVAL NASA	REFERENCES
							IMPORTANT
							INTERVAL
							TOOLS AND MATERIAL

1. Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.

CTS SWITCH INITIALIZATION

2. Set the DC voltmeter (DCVM) to ON and to accept DC signals. Set RDC panel switches as follows:
   a. DE MARGINS to NORM
   b. CHAN V METERS to DCVM
   c. CHANNEL V to 601
3. Perform the following DSKY operations:

VERB 57	ENTR
00011	ENTR

Row 1 shall indicate 00005 and ROW2 shall indicate 00377.

RCS JET ON-OFF TEST

4. Set CHANNEL V switches to positions specified below and record DCVM indications for each position.

	CHANNEL V	RCS JET
a.	601	-X4U
b.	602	+X4D
c.	603	-X3U
d.	604	+X3D
e.	605	-X2U
f.	606	+X2D
g.	607	-X1U
h.	608	+X1D

5. Press ENTR pushbutton on the DSKY. Row 1 shall indicate 00006 and ROW2 shall indicate 00377.

6. Set CHANNEL V switches to positions specified in step 4, and record DCVM indications for each position.
7. Set CHANNEL V switches to positions specified below and record DCVM indications for each position:

	CHANNEL V	RCS JET
a.	609	+Z3F
b.	610	-Z4F
c.	611	-Z1F
d.	612	+Z2F
e.	613	+Y2S
f.	614	-Y3S
g.	615	-Y4S
h.	616	-Y1S

8. Press ENTR pushbutton. Row 1 shall indicate 00011 and ROW2 shall indicate 30000.
9. Set CHANNEL V switches to positions specified in step 7 and record DCVM indications for each position.

ENG ON-OFF ASC OR DESC TEST

10. Set CHANNEL V switches to positions 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record DCVM indications for each position.
11. Press ENTR pushbutton. Row 1 shall indicate 00013 and ROW2 shall indicate 37000.
12. Set CHANNEL V switches to positions 506 and 520. Record DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

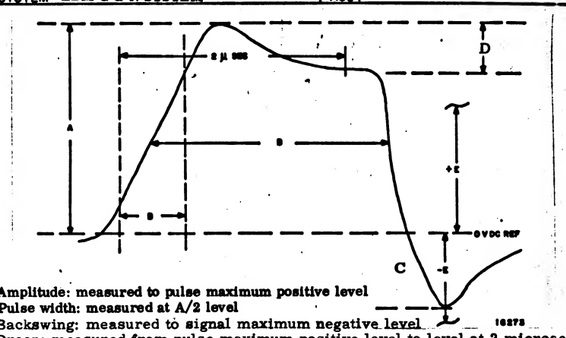
13. Set CHANNEL V switches to positions specified below and record DCVM indications for each position:

	CHANNEL V	GIMBAL TRIM
a.	406	+ Pitch
b.	501	- Pitch
c.	504	+ Roll
d.	617	- Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS CMD lamps on Monitor panel are lighted.
15. Press ENTR pushbutton.
16. Set CHANNEL V switches to positions specified in step 13 and record DCVM indications for each position. Observe that the lamps specified in step 14 are not lighted. Set CHANNEL V switches to position 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Initialize XY INTERFACE panel as follows:
    SCOPE to DIFF S
    CHANNEL S to 213 (Inc. Throttle Rate Descent Engine)
    SCOPE A jumper coax to A input on scope
    LOAD CHAN S 200 OHMS to lighted.
18. Measure and record the scope indications of A through F represented in figure 1.
19. Press ENTR pushbutton. Signal on scope shall disappear.
20. Set CHANNEL S switches to position 214 (Dec Throttle Rate Desc Engine).



A - Amplitude: measured to pulse maximum positive level
B - Pulse width: measured at A/2 level
C - Backswing: measured to signal maximum negative level
D - Droop: measured from pulse maximum positive level to level at 2 microseconds
E - Rise Time: time required for pulse to rise from 10% to 90% of A
F - Noise: (No pulse)

Figure 1. Waveform Description

Measure and record the scope indications of A through F represented in figure 1.

21. Press ENTR pushbutton. Signal on scope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set CHANNEL S switches to positions 317 (Altitude "1") and 318 (Altitude "0"). Measure and record the scope indications of A through E for each position. (See figure 1.)
23. Press ENTR pushbutton, set CHANNEL S switches to positions 317 and 318 and observe that the signals on the scope have disappeared for each position.

ALTITUDE RATE "1", ALTITUDE RATE "0" TEST

24. Set CHANNEL S switches to positions 319 (Altitude Rate "1") and 320 (Altitude Rate "0"). Measure and record the scope indications of A through E for each position.
25. Press ENTR pushbutton, set CHANNEL S switches to positions 319 and 320 and observe that the signal on the scope disappears for each position.

RR AND LR RESET STROBE TEST

26. Press LOAD CHAN S 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons on XY INTERFACE panel. Set CHANNEL S switches to 106 (RR Reset Strobe) and 118 (LR Reset Strobe). Measure and record the scope indications of A through F for each position.

LR RANGE READ CYCLE TIMING TEST

27. Set CHANNEL T switches to 220 (LR Range Gate Strobe) and CHANNEL S

switches to 314 (LR Sync for Readout).

28. Set FREQ + PHASE switch to FR T T→S. Interconnect coax jumper to CNTR-A (XY INTERFACE panel) and FREQ A AC (COUNTER). Interconnect coax jumper to CNTR-B (XY INTERFACE panel) and STOP B (COUNTER).
29. Set COUNTER controls as follows:
    INPUT VOLTS RMS to 1.6
    TRIGGER LEVEL to mid range
    TIME to MS
    DISPLAY to ∞
    GATE to AUTO
    SLOPE to +.
30. Set SCOPE switch to DIFF T.
31. Perform the following DSKY operations:

VERB 57	ENTR
00014	ENTR
VERB 33	ENTR

Record the COUNTER indication.

NOTE: If in the above step, the COUNTER did not count or indicate about 80 milliseconds, press RESET, and adjust INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.

LR RANGE GATE STROBE TEST

32. Adjust scope and measure and record scope indication of A through F represented on Figure 1.

LR RANGE GATE STROBE TIMING TEST

33. Set CHANNEL S switches to 118 (LR Reset Strobe) and set SCOPE switch to S→T.
34. Interconnect coax to SCOPE B jack and B input jack on scope.
35. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

36. Set CHANNEL S switches to 314 (LR Sync for Readout) and set SCOPE switch to DIFF S. Measure and record the scope indication of A through F represented on figure 1.

LR RANGE DATA ACQUISITION TEST

37. Perform the following DSKY operation:

VERB 01	NOUN 01	ENTR
Address of LR Range data		ENTR

Row 1 shall indicate 77777.

LR Z_A READ CYCLE TIMING TEST

38. Reset the COUNTER. Set CHANNEL T switches to 219 (LR Z_A gate strobe) and CHANNEL S to 314.
39. Press ENTR pushbutton, record COUNTER indication.

LR Z_A GATE STROBE TIMING TEST

40. Set CHANNEL S switches to 118 and set SCOPE switch to S⟶T.

41. Determine the Timing lag of a LR Z_A Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR Z_A GATE STROBE TEST

42. Set SCOPE switch to DIFF T and measure and record the scope indications of A through F represented in figure 1.

LR Z_A DATA ACQUISITION TEST

43. Perform following DSKY operations:

VERB 01	NOUN 01	ENTR
Address of Z_A data		ENTR

Row 1 shall indicate 77777.

LR Y_A READ CYCLE TIMING TEST

44. Reset the COUNTER. Set CHANNEL T switches to 218 (LR Y_A Gate Strobe) and CHANNEL S to 314.

45. Press ENTR pushbutton, record COUNTER indication.

LR Y_A GATE STROBE TIMING TEST

46. Set CHANNEL S switches to 118 and SCOPE switch to S⟶T.

47. Determine the timing lag of a LR Y_A Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR Y_A GATE STROBE TEST

48. Set SCOPE switch to DIFF T and measure and record the scope indications of A through F represented in figure 1.

LR Y_A DATA ACQUISITION TEST

49. Perform following DSKY operations:

VERB 01	NOUN 01	ENTR
Address of Y_A data		ENTR

Row 1 shall indicate 77777.

LR X_A READ CYCLE TIMING TEST

50. Reset the COUNTER. Set CHANNEL T switches to 217 (LR X_A Gate Strobe) and CHANNEL S to 314.

51. Press ENTR pushbutton, record COUNTER indication.

LR X_A GATE STROBE TIMING TEST

52. Set CHANNEL S switches to 113 and SCOPE switch to S⟶T.

53. Determine the timing lag of a LR X_A Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR X_A GATE STROBE TEST

54. Set SCOPE switch to DIFF T and measure and record the scope indications of A through F represented in figure 1.

LR X_A DATA ACQUISITION TEST

55. Perform following DSKY operations:

VERB 01	NOUN 01	ENTR
Address of X_A data		ENTR

Row 1 shall indicate 77777.

RR RANGE READ CYCLE TIMING TEST

56. Reset the COUNTER. Set CHANNEL T switches to 215 (RR Range Gate Strobe) and CHANNEL S to 313 (RR Sync for Readout).

57. Press ENTR pushbutton, record COUNTER indication.

DATE _____

RR SYNC FOR READOUT STROBE TEST

58. Set SCOPE switch to DIFF S. Measure and record the scope indications of A through F as represented in figure 1.

RR RANGE GATE STROBE TIMING TEST

59. Set CHANNEL S switches to 105 and SCOPE switch to S⟶T.

60. Determine the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

61. Set SCOPE switch to DIFF T and measure and record the scope indication of A through F represented in figure 1.

RR RANGE DATA ACQUISITION TEST

62. Perform the following DSKY operations:

VERB 01	NOUN 01	ENTR
Address of RR Range data		ENTR

Row 1 shall indicate 77777.

RR RANGE RATE READ CYCLE TIMING TEST

63. Reset the COUNTER. Set CHANNEL T switches to 216 (RR Range Rate Strobe) and CHANNEL S to 313.

64. Press ENTR pushbutton, record COUNTER indications.

RR RANGE RATE GATE STROBE TIMING TEST

65. Set CHANNEL S switches to 105 and SCOPE switch to S⟶T.

66. Determine the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

67. Set SCOPE switch to DIFF T and measure and record the scope indication of A through F respectively in figure 1.

RR RANGE RATE DATA ACQUISITION TEST

68. Perform the following DSKY operations:

VERB 01	NOUN 01	ENTR
Address of RR Range data		ENTR

Row 1 shall indicate 77777.

69. Press ENTR pushbutton.

DOWNLINK TELEMETRY TEST

70. Perform the following DSKY operation:

VERB	NOUN	ENTR

71. Press STBY pushbutton on DSKY.

72. Press DL ENABLE and WORD RATE 50 PPS pushbuttons.

73. Set CHANNEL T switches to 102 (DLNK DATA) and measure and record the scope indications of A, B, D, E and F as represented in figure 1.

74. Set SCOPE switch to S⟶T and CHANNEL S switches to 307 (DLNK SYNC). Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

DATE _____

75. Press WORD RATE 10 PPS pushbutton, adjust scope and repeat step 74.

76. Press WORD RATE 300 PPS pushbutton.

77. Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00033		ENTR

Row 1 shall indicate X3XXX.

78. Press DL ENABLE pushbutton. Set CHANNEL S and T switches to 101.

79. Press STBY pushbutton on DSKY.

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TDRR 27134 MAR 15 1968

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 1 OF 9

JDC NO. 12621
REV. -
INITIAL TDRR -

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST	TEST HISTORY
TITLE _____	DATE START ____ END ____ SITE / LOCATION ____
SER. NO. ____ DWG ____ REV. ____	TIME START ____ END ____ TOTAL ELAPSED ____

MAJOR GROUND SUPPORT EQUIPMENT

NAME _____ SER. NO. ____ CAL DATE ____
NAME _____ SER. NO. ____ CAL DATE ____

CONDUCTED BY _____ NAME/AFFILIATION APPROVED BY _____ NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
4.a.	RCS JET -X4U	vdc	2.0		5.0		
4.b.	RCS JET +X4D	vdc	2.0		5.0		
4.c.	RCS JET -X3U	vdc	2.0		5.0		
4.d.	RCS JET +X3D	vdc	2.0		5.0		
4.e.	RCS JET -X2U	vdc	2.0		5.0		
4.f.	RCS JET +X2D	vdc	2.0		5.0		
4.g.	RCS JET -X1U	vdc	2.0		5.0		
4.h.	RCS JET +X1D	vdc	2.0		5.0		
6.a.	RCS JET -X4U	vdc	9.0		11.0		
6.b.	RCS JET +X4D	vdc	9.0		11.0		
6.c.	RCS JET -X3U	vdc	9.0		11.0		
6.d.	RCS JET +X3D	vdc	9.0		11.0		
6.e.	RCS JET -X2U	vdc	9.0		11.0		
6.f.	RCS JET +X2D	vdc	9.0		11.0		
6.g.	RCS JET -X1U	vdc	9.0		11.0		
6.h.	RCS JET +X1D	vdc	9.0		11.0		
7.a.	RCS JET +Z3F	vdc	2.0		5.0		
7.b.	RCS JET -Z4F	vdc	2.0		5.0		
7.c.	RCS JET -Z1F	vdc	2.0		5.0		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 2 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.d.	RCS JET +Z2F	vdc	2.0		5.0		
7.e.	RCS JET +Y2S	vdc	2.0		5.0		
7.f.	RCS JET -Y3S	vdc	2.0		5.0		
7.g.	RCS JET -Y4S	vdc	2.0		5.0		
7.h.	RCS JET -Y1S	vdc	2.0		5.0		
9.a.	RCS JET +Z3F	vdc	9.0		11.0		
9.b.	RCS JET -Z4F	vdc	9.0		11.0		
9.c.	RCS JET -Z1F	vdc	9.0		11.0		
9.d.	RCS JET +Z2F	vdc	9.0		11.0		
9.e.	RCS JET +Y2S	vdc	9.0		11.0		
9.f.	RCS JET -Y3S	vdc	9.0		11.0		
9.g.	RCS JET -Y4S	vdc	9.0		11.0		
9.h.	RCS JET -Y1S	vdc	9.0		11.0		
10.a.	ENG ON	vdc	2.0		5.0		
10.b.	ENG OFF	vdc	2.0		5.0		
12.a.	ENG ON	vdc	9.0		11.0		
12.b.	ENG OFF	vdc	9.0		11.0		
13.a.	+ PITCH GIMBAL TRIM	vdc	2.0		5.0		
13.b.	- PITCH GIMBAL TRIM	vdc	2.0		5.0		
13.c.	+ ROLL GIMBAL TRIM	vdc	2.0		5.0		
13.d.	-ROLL GIMBAL TRIM	vdc	2.0		5.0		
16.a.	+ PITCH GIMBAL TRIM	vdc	9.0		11.0		

DATE _____

FORM 0147

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 3 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
16.b.	- PITCH GIMBAL TRIM	vdc	9.0		11.0		
16.c.	+ ROLL GIMBAL TRIM	vdc	9.0		11.0		
16.d.	- ROLL GIMBAL TRIM	vdc	9.0		11.0		
18	INCR THROTTLE RATE DESC ENG						
18A	Amplitude	volts	4		10		
18B	Pulse Width	usec	2.0		4.0		
18C	Backswing	volts			4.0		
18D	Droop	volts			+A/5		
18E	Rise Time	usec			0.20		
18F	Noise	volts	-4.0		+0.4		
20	DECR THROTTLE RATE DESC ENG						
20A	Amplitude	volts	4.0		10.0		
20B	Pulse Width	usec	2.0		4.0		
20C	Backswing	volts			4.0		
20D	Droop	volts	-A/5		+A/5		
20E	Rise Time	usec			0.20		
20F	Noise	volts	-4.0		+0.4		
22A	ALTITUDE "1"						
22AA	Amplitude	volts	4.0		10.0		
22AB	Pulse Width	usec	2.0		4.0		
22AC	Backswing	volts			4.0		

DATE _____

FORM 0147

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 4 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
22AD	Droop	volts			+A/5		
22AE	Rise Time	usec			0.2		
22B	ALTITUDE "0"						
22BA	Amplitude	volts	4.0		10.0		
22BB	Pulse Width	usec	2.0		4.0		
22BC	Backswing	volts			4.0		
22BD	Droop	volts			+A/5		
22BE	Rise Time	usec			0.2		
		-					
24A	ALTITUDE RATE "1"						
24AA	Amplitude	volts	4.0		10.0		
24AB	Pulse Width	usec	2.0		4.0		
24AC	Backswing	volts			4.0		
24AD	Droop	volts			+A/5		
24AE	Rise Time	usec			0.2		
24B	ALTITUDE RATE "0"						
24BA	Amplitude	volts	4.0		10.0		
24BB	Pulse Width	usec	2.0		4.0		
24BC	Backswing	volts			4.0		
24BD	Droop	volts			+A/5		
24BE	Rise Time	usec			0.2		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 5 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
26A	RR Reset Strobe						
26AA	Amplitude	volts	4.0		10.0		
26AB	Pulse Width	usec	2.5		3.5		
26AC	Backswing	volts			4.0		
26AD	Droop	volts			+A/5		
26AE	Rise Time	usec			0.2		
26AF	Noise	volts			+0.4		
26B	LR Reset Strobe						
26BA	Amplitude	volts	4.0		10.0		
26BB	Pulse Width	usec	2.5		3.5		
26BC	Backswing	volts			4.0		
26BD	Droop	volts			+A/5		
26BE	Rise Time	usec			0.2		
26BF	Noise	volts			+0.4		
31	LR RANGE READ CYCLE TIMING	usec	80.315				
32	LR RANGE GATE STROBE						
32A	Amplitude	volts	4.0		10.0		
32B	Pulse Width	usec	2.5		3.5		
32C	Backswing	volts			4.0		
32D	Droop	volts			+A/5		
32E	Rise Time	usec			0.2		
32G	Noise	volts			+0.4		

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 6 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
35	LR RANGE GATE STROBE TIMING	usec	1.75		2.25		
36	LR SYNC FOR READOUT STROBE						
36A	Amplitude	volts	4.0		10.0		
36B	Pulse Width	usec	2.5		3.5		
36C	Backswing	volts			4.0		
36D	Droop	volts			+A/5		
36E	Rise Time	usec			0.2		
36F	Noise	volts			+0.4		
39	LR Z_A READ CYCLE TIMING	usec	80.315				
41	LR Z_A GATE STROBE TIMING	usec	1.75		2.25		
42	LR Z_A GATE STROBE						
42A	Amplitude	volts	4.0		10.0		
42B	Pulse Width	usec	2.5		3.5		
42C	Backswing	volts			4.0		
42D	Droop	volts			+A/5		
42E	Rise Time	usec			0.2		
42F	Noise	volts			+0.4		
45	LR Y_A READ CYCLE TIMING	usec	80.315				

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 7 OF 9

JDC NO. 12621
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
47	LR Y_A GATE STROBE TIMING	usec	1.75		2.25		
48	LR Y_A GATE STROBE						
48A	Amplitude	volts	4.0		10.0		
48B	Pulse Width	usec	2.5		3.5		
48C	Backswing	volts			4.0		
48D	Droop	volts			+A/5		
48E	Rise Time	usec			0.2		
48F	Noise	volts			+0.4		
51	LR X_A READ CYCLE TIMING	usec	80.315				
53	LR X_A GATE STROBE TIMING	usec	1.75		2.25		
54	LR X_A GATE STROBE						
54A	Amplitude	volts	4.0		10.0		
54B	Pulse Width	usec	2.5		3.5		
54C	Backswing	volts			4.0		
54D	Droop	volts			+A/5		
54E	Rise Time	usec			0.2		
54F	Noise	volts			+0.4		
57	RR RANGE READ CYCLE TIMING	usec	80.935				
58	RR SYNC FOR READOUT						

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APOLLO G&N
EQUIPMENT TEST
DATA SHEET 8 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
58A	Amplitude	volts	4.0		10.0		
58B	Pulse Width	usec	2.5		3.5		
58C	Backswing	volts			4.0		
58D	Droop	volts			+A/5		
58E	Rise Time	usec			0.2		
58F	Noise	volts			+0.4		
60	RR RANGE GATE STROBE TIMING	usec	80.935				
61	RR RANGE GATE STROBE						
61A	Amplitude	volts	4.0		10.0		
61B	Pulse Width	usec	2.5		3.5		
61C	Backswing	volts			4.0		
61D	Droop	volts			+A/5		
61E	Rise Time	usec			0.2		
61F	Noise	volts			+0.4		
64	RR RANGE RATE READ CYCLE TIMING	usec	80.935				
66	RR RANGE RATE STROBE TIMING	usec	1.75		2.25		
67	RR RANGE RATE STROBE						
67A	Amplitude	volts	4.0		10.0		
67B	Pulse Width	usec	2.5		3.5		
67C	Backswing	volts			4.0		

DATE _____

APOLLO G&N
EQUIPMENT TEST
DATA SHEET 9 OF 9

JDC NO. 12621
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
67D	Droop	volts			+A/5		
67E	Rise Time	usec			0.2		
67G	Noise	volts			+0.4		
73	TELEMETRY DLNK DATA						
73A	Amplitude	volts	5.0		9.0		
73B	Pulse Width	usec	2.0		6.0		
73D	Droop	volts			+A/5		
73E	Rise Time	usec			0.2		
73G	Noise	volts	-6.0		+0.4		
74	DLNK DATA-SYNC DELAY TIME	usec			1.0		
75	DLNK DATA-SYNC DELAY TIME (10 PPS)	usec			1.0		
3,5,8, 11,14, 15,19, 22,23, 25,37, 43,49, 55,62, 68,77	DISPLAYS (Reacted as specified)						

DATE _____